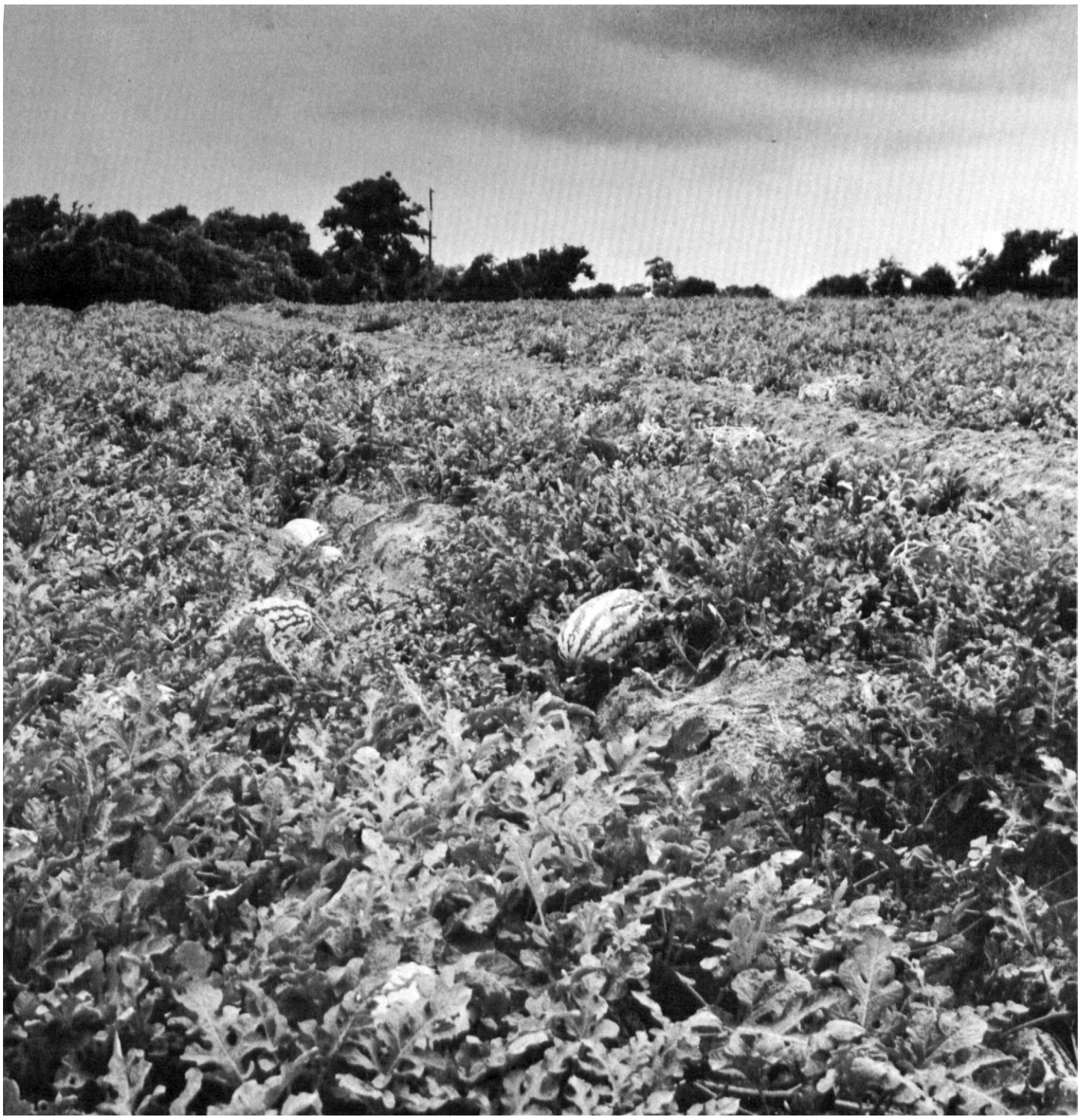
United States Department of Agriculture

Soil Conservation Service

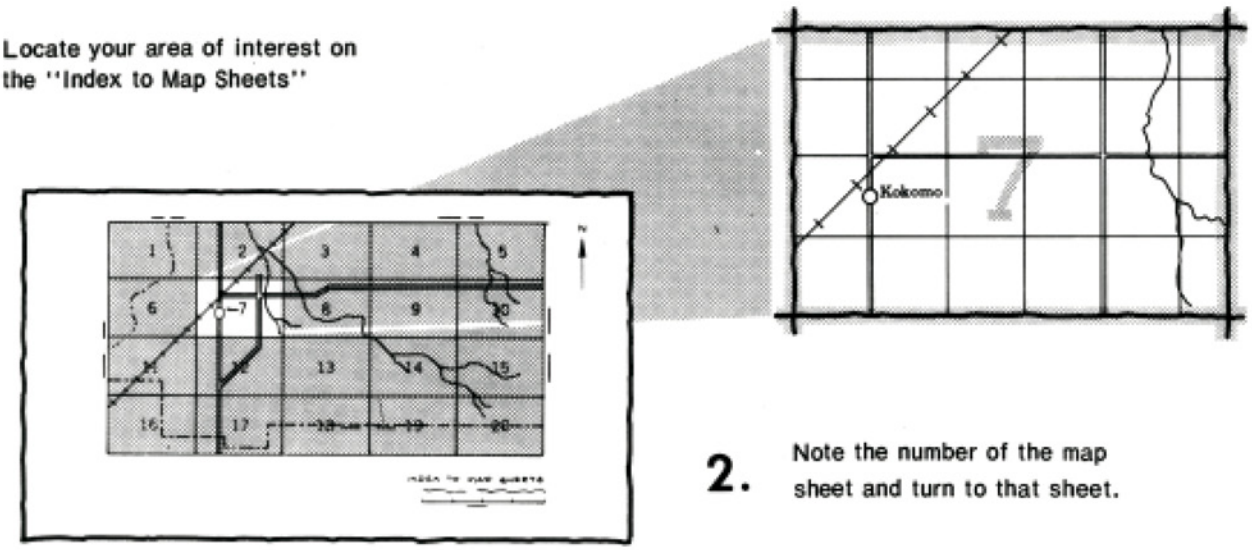
In Cooperation with the Texas Agricultural Experiment Station

Soil Survey of Austin and Waller Counties Texas



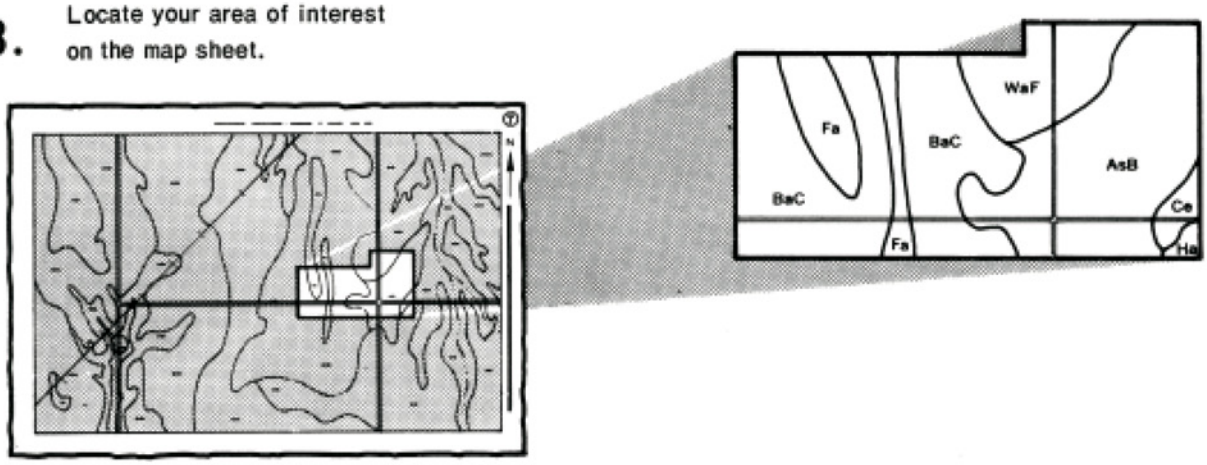
HOW TO USE

1. Locate your area of interest on the "Index to Map Sheets"

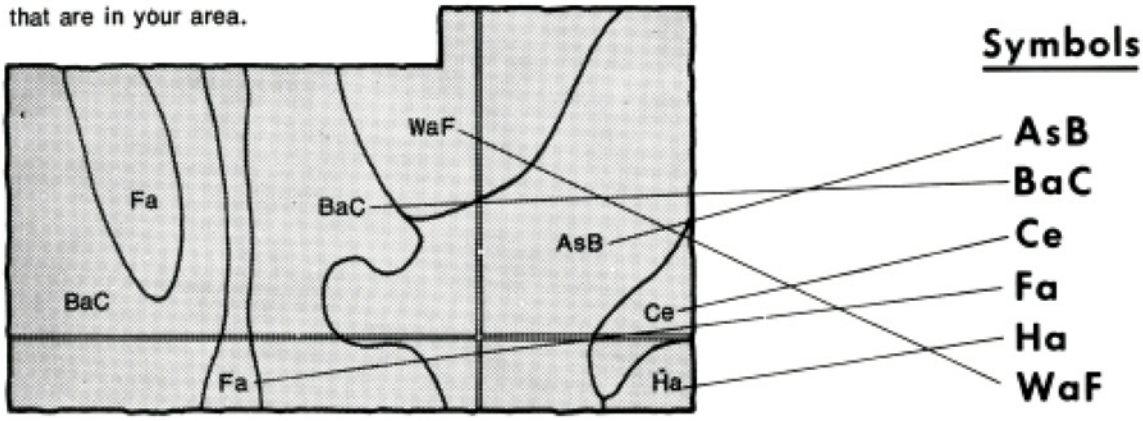


2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.

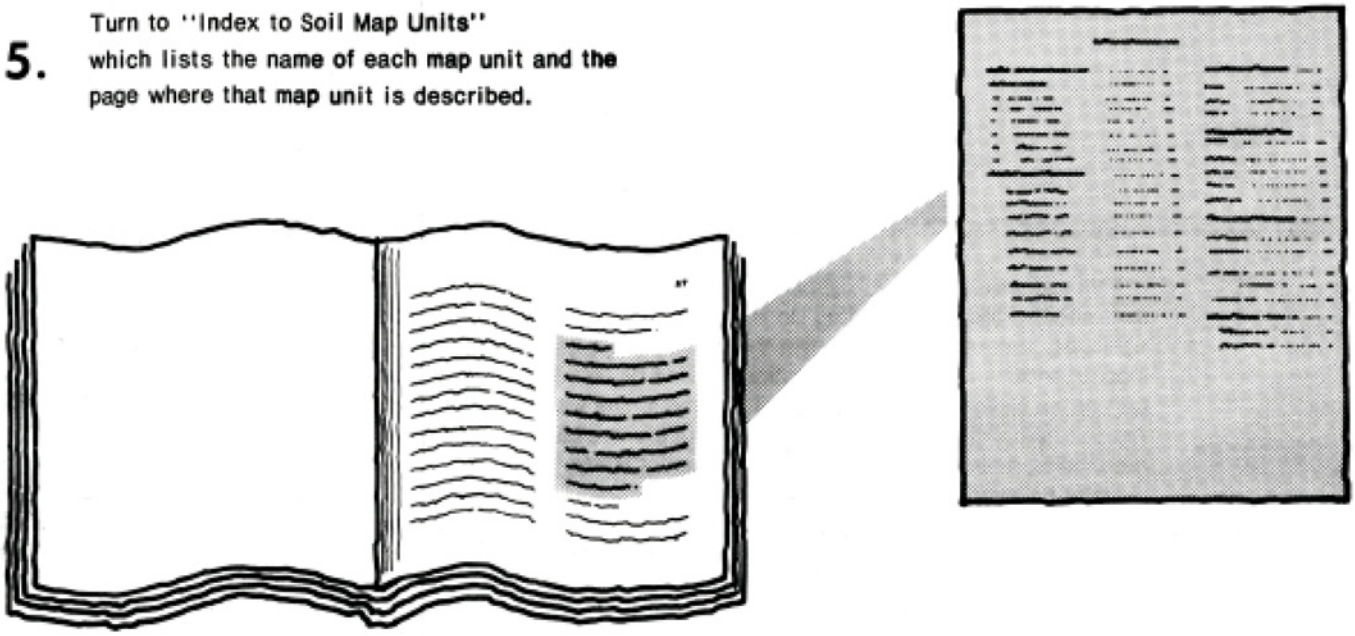


4. List the map unit symbols that are in your area.

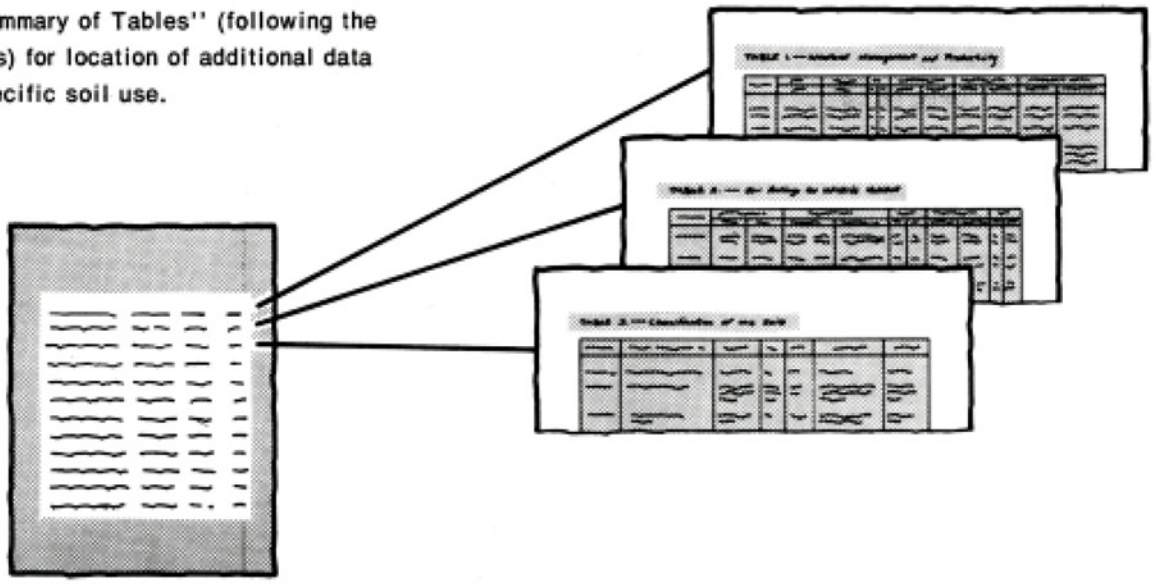


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

This survey was made cooperatively by the Soil Conservation Service and the Texas Agricultural Experiment Station. It is part of the technical assistance furnished to the Austin County Soil and Water Conservation District and the Navasota Soil and Water Conservation District. Major fieldwork for this soil survey was performed in the period 1975-80. Soil names and descriptions were approved in 1981. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1981.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: Watermelons on Kenney loamy fine sand.

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soil series

Issued March 1984

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foreword

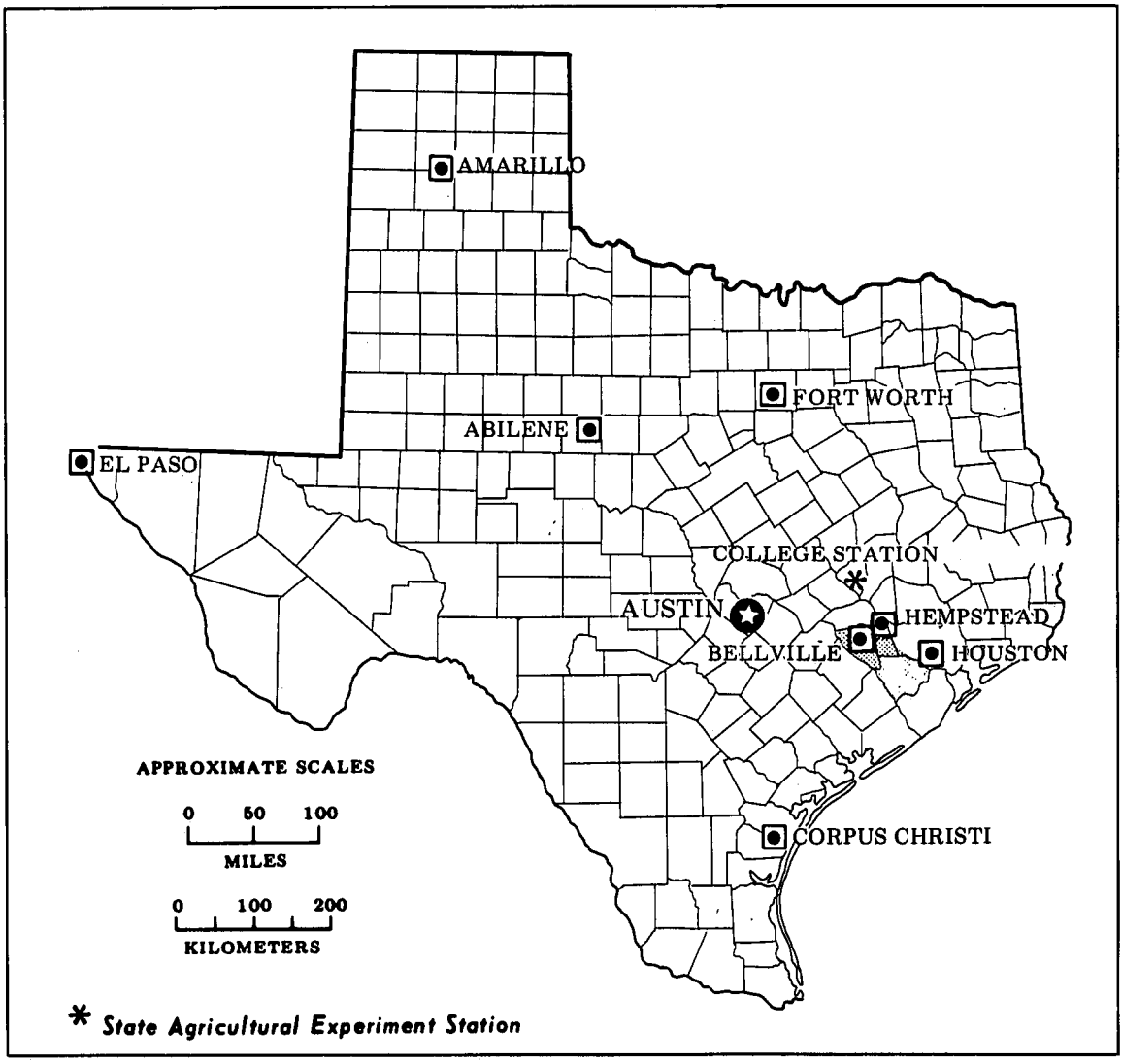
This soil survey contains information that can be used in land-planning programs in Austin and Waller Counties. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

George C. Marks
State Conservationist
Soil Conservation Service



Location of Austin and Waller Counties in Texas

soil survey of
Austin and Waller Counties, Texas

By James M. Greenwade, Soil Conservation Service

Wilfred Crenwelge, Ronald L. Schlappi, Stanley G. Hitt, and
Michael Stewart, Soil Conservation Service, assisted in field mapping

United States Department of Agriculture, Soil Conservation Service
in cooperation with the Texas Agricultural Experiment Station

AUSTIN AND WALLER COUNTIES are in southeast-central Texas. Their total area is 753,280 acres (1,177 square miles). The Brazos River is the boundary between the two counties.

Bellville is the county seat of Austin County, and Hempstead is the county seat of Waller County. Also in Austin County are Bleiblerville, Cat Spring, Industry, Kenney, New Ulm, Sealy, Shelby, and Wallis. Waller County contains Brookshire, Pattison, Prairie View, and Waller.

The survey area is dissected by many well defined drainageways. Most of the area drains into the Brazos River. Parts of Austin County drain into the San Benard and Colorado Rivers. Part of Waller County drains into the San Jacinto River.

Elevation in the two counties ranges from about 120 feet above sea level along the Brazos River to about 460 feet in northwestern Austin County. The highest elevation in Waller County is about 370 feet.

Descriptions, names, and delineations of soils in the survey do not fully agree with those on soil maps for adjacent counties. The disagreements result from improvements in knowledge of soils, modifications in series concepts, and differences in intensity of mapping or in the extent of soils in the areas.

general nature of the area

In 1821, Stephen F. Austin received permission from the Spanish government to settle 300 families in Texas. Austin's colony included all of present-day Austin and Waller Counties. San Felipe, in southern Austin County, was established in 1824 as the headquarters for the colony.

Austin County was organized in 1836 and named for Stephen F. Austin. Waller County was created in 1873 from portions of Austin and Grimes Counties. It was named for Edwin Waller, a leader in the Republic of Texas.

The population of the counties increased until about 1910, then decreased until about 1950, to remain stable until 1970. Since 1970, the population has increased rapidly because of proximity to Houston. The population of Austin County was 16,352 in 1980, and the population of Waller County was 23,650.

Throughout the history of this area, farming and ranching have been the main means of livelihood. In recent years, more people commute to jobs in Houston; and many people from Houston have purchased small farms in the area. Many areas have been subdivided for homesites, and the increase in urban use is expected to continue.

agriculture

Pasture is the largest land use in the survey area, followed by crops, range, and woodland. Pasture and range are used mainly for production of beef cattle. Most operations are cow-calf; some ranchers adjust stocking rates with stocker calves.

Much of Waller County is cultivated. Most of Austin County is in pasture and range. Farms are also larger in the less sloping parts of Waller County than in Austin County. Many areas now in range, pasture, or woodland are suitable for crops; and probably a considerable acreage will continue to be farmed in the near future.

Urban uses take some land from agriculture each year. Part of eastern Waller County is used for timber production; however, the acreage of timber is declining because of conversion to urban uses.

transportation and markets

The network of Interstate 10, U.S. Highway 290, and many Texas highways and farm roads is excellent for movement of agricultural products, industrial goods, and other traffic.

The survey area is served by three major railroads. Rail transport is becoming more important, but most goods are moved by truck.

Many private air fields are in the area. Most are used for agricultural purposes rather than for transportation. Airplanes are used extensively in rice production in the southern part of the survey area.

Because most of the survey area is less than 60 miles from the port of Houston, transportation of corn, soybeans, and rice is less costly for local farmers than for those farther inland. To take advantage of seasonal markets, local farmers often plant early maturing varieties. Much of the vegetable and truck crops is marketed at roadside stands, and some is trucked to market in Houston.

The largest livestock market in the area is at Sealy and provides a continuous outlet for cattle, sheep, and hogs.

natural resources

Soil is the most important natural resource in Austin and Waller Counties. Food and fiber for market and home and forage for livestock are the major sources of income.

Water is another natural resource. Irrigation wells provide water for rice farming in the southern part of the area. The Brazos River is a source of irrigation water for some farmers and a source of recreation. Wells also provide water for urban use.

Gravel for construction is scarce. A few sand and gravel deposits near the Brazos River and ironstone gravel in the upper part of some soils are used for road construction.

Oil and gas are produced in some parts of the survey area.

climate

Prepared by the National Climatic Center, Asheville, North Carolina.

The area of Austin and Waller Counties is hot in summer but cool in winter when occasional surges of cold air cause a sharp drop in otherwise mild temperatures. Rainfall is uniformly distributed throughout the year, reaching a peak in spring. Snowfalls are infrequent. Total annual precipitation is normally adequate for cotton, feed grains, and small grains.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Sealy, Texas, in the period 1951 to 1978. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 55 degrees F, and the average daily minimum temperature is 44 degrees. The lowest temperature on record, which occurred on February 2, 1951, is 8 degrees. In summer the average temperature is 83 degrees, and the average daily maximum temperature is 95 degrees. The highest recorded temperature, which occurred on July 26, 1954, is 110 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is about 40 inches. Of this, 22 inches, or 60 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 15 inches. The heaviest 1-day rainfall during the period of record was 6.05 inches on September 12, 1961. Thunderstorms occur on about 60 days each year, and most occur in summer.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 90 percent. The sun shines 70 percent of the time possible in summer and 50 percent in winter. The prevailing wind is from the south-southeast. Average windspeed is highest, 9 miles per hour, in spring.

Tornadoes and severe thunderstorms occur occasionally. These storms are local and short. The pattern of damage is variable and spotty.

how this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately.

The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map units" and "Detailed soil map units."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, rangeland and woodland managers, engineers, planners, developers and builders, home buyers, and others.

general soil map units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The 15 soil associations make up about 99 percent of area of the two counties; the rest is water.

loamy and sandy soils of prairies

The associations in this group make up about 35 percent of the survey area. The major soils are in the Katy, Wockley, Hockley, and Monaville series. These soils are nearly level to gently sloping. Native vegetation is mainly mid and tall grasses.

Most areas of these soils are used for crops or pasture. Rice, corn, peanuts, and specialty crops are grown. Urban use is expanding.

1. Katy association

Nearly level to gently sloping, somewhat poorly drained, loamy soils

This association consists of soils on broad uplands. The native vegetation was tall prairie grasses and scattered shrubs.

This association makes up about 15 percent of the survey area. It is about 60 percent Katy soils and 40 percent other soils.

Katy soils typically have a surface layer of grayish brown fine sandy loam about 10 inches thick. The subsurface layer is 12 inches of pale brown fine sandy loam. The upper 7 inches of the subsoil is grayish brown sandy clay loam, and the lower part, to a depth of 80 inches, is gray and light gray clay that has reddish and brownish mottles.

Minor in this association are Aris, Edna, Hockley, Midland, and Wockley soils. Nearly level, loamy Aris soils are in slight depressions. Nearly level to gently sloping, loamy Edna and Midland soils are on broad flats and breaks. Nearly level to gently sloping, loamy Hockley and Wockley soils are on the higher sides and tops of hills.

This association is used mainly for crops and pasture. These soils are the main soils used for growing rice in the survey area. They are ideally suited to rice because of the loamy surface layer and clayey subsoil. Some areas have been subdivided for homesites and small farms. The major problems for urban uses are the moderately slow permeability and restricted drainage.

2. Hockley-Wockley-Monaville association

Nearly level to gently sloping, moderately well drained and somewhat poorly drained, loamy and sandy soils

This association consists of gently sloping Hockley and Monaville soils on hillsides and ridges and nearly level to gently sloping Wockley soils on foot slopes and flats. The native vegetation is mostly tall prairie grasses with scattered trees and shrubs.

This association makes up 12 percent of the survey area. It is 28 percent Hockley soils, 16 percent Wockley soils, 11 percent Monaville soils, and 45 percent minor soils.

Hockley soils typically have a surface layer of brown fine sandy loam about 7 inches thick. The subsurface layer is 15 inches of grayish brown fine sandy loam. The subsoil is sandy clay loam that is yellowish brown in the upper part, light yellowish brown in the middle part, and light gray in the lower part to a depth of 61 inches. Reddish, yellowish, and brownish mottles occur throughout the subsoil.

Wockley soils typically have a surface layer of dark grayish brown fine sandy loam about 12 inches thick. The subsurface layer is 11 inches of brown fine sandy loam. The subsoil is light brownish gray sandy clay loam in the upper part, light gray clay loam in the middle part, and mottled clay loam in the lower part to a depth of 80 inches. Mottles are reddish, yellowish, and grayish.

Monaville soils typically have a surface layer of brown loamy fine sand about 15 inches thick. The subsurface layer is 13 inches of yellowish brown loamy fine sand.

The subsoil is sandy clay loam that is light yellowish brown and pale brown in the upper part, dark grayish brown in the middle part, and yellowish brown in the lower part to a depth of 74 inches.

Minor in this association are Edna, Katy, Midland, Kenney, Nahatche, Segno, and Waller soils. The nearly level to gently sloping, loamy Edna, Katy, and Midland soils are on foot slopes and flats. Gently sloping Kenney soils are on sides and tops of ridges. Nearly level, loamy Nahatche soils are on flood plains. Nearly level Waller soils are in depressions.

This association is used mainly for pasture and crops. The main crops are corn, peanuts, and soybeans. Coastal bermudagrass and bahiagrass are the principal grasses in improved pasture. Some areas have been subdivided for homesites and small farms. The main limitations for urban uses are restricted drainage and moderately slow permeability in some places.

3. Wockley-Hockley association

Nearly level to gently sloping, somewhat poorly drained and moderately well drained, loamy soils

This association consists of nearly level to gently sloping Wockley soils on foot slopes and flats and gently sloping Hockley soils on hillsides and ridges (fig. 1). The native vegetation is mostly tall prairie grasses and scattered small trees and shrubs.

This association makes up about 8 percent of the survey area. It is 38 percent Wockley soils, 18 percent Hockley soils, and 44 percent minor soils.

Wockley soils typically have a surface layer of dark grayish brown fine sandy loam about 12 inches thick. The subsurface layer is 11 inches of brown fine sandy loam. The subsoil is light brownish gray sandy clay loam in the upper part, light gray clay loam in the middle part, and mottled clay in the lower part to a depth of 80 inches. Mottles are reddish, yellowish, and grayish.

Hockley soils typically have a surface layer of brown fine sandy loam about 7 inches thick. The subsurface layer is 15 inches of grayish brown fine sandy loam. The subsoil is sandy clay loam that is yellowish brown in the upper part, light yellowish brown in the middle part, and light gray in the lower part to a depth of 61 inches. Reddish, yellowish, and brownish mottles are throughout the subsoil.

Minor in this association are Edna, Katy, Midland, Monaville, Kenney, Nahatche, Segno, and Waller soils. Nearly level to gently sloping, loamy Edna, Katy, and Midland soils are on foot slopes and broad flats. Gently sloping, sandy Monaville and Kenney soils are on sides and tops of ridges. Nearly level, loamy Nahatche soils are on flood plains. Gently sloping, loamy Segno soils are on side slopes and breaks. Nearly level, loamy Waller soils are in depressions.

The association is used mainly for crops and pasture. The main crops are corn, peanuts, and soybeans. Coastal bermudagrass and bahiagrass are the principal grasses in improved pasture. Some areas have been subdivided for homesites and small farms. The main

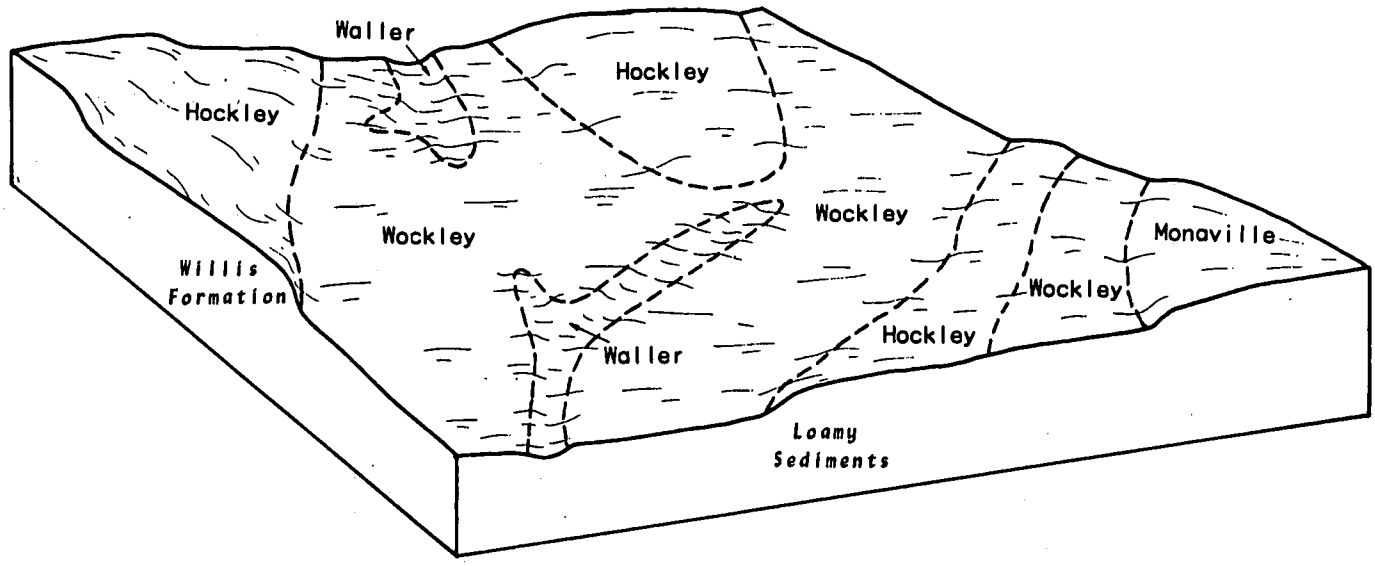


Figure 1.—Pattern of soils in the Wockley-Hockley association.

limitations for urban uses are restricted drainage and moderately slow permeability in some places.

sandy and loamy soils of savannahs

The associations in this group make up about 22 percent of the survey area. The major soils are in the Tabor, Tremona, Chazos, Kenney, and Catilla series. These soils are nearly level to sloping. Native vegetation includes tall grasses and scattered hardwoods.

Most areas of these soils are used for pasture and range. Some areas are cropped to corn, peanuts, and other specialty crops. Urban use is expanding.

4. Tabor-Tremona-Chazos association

Gently sloping to sloping, moderately well drained and somewhat poorly drained, loamy and sandy soils

This association consists of Tabor soils on hillsides, Tremona soils on foot slopes, and Chazos soils on ridges and breaks. The native vegetation was tall grasses and scattered hardwoods.

This association makes up about 8 percent of the survey area. It is about 25 percent Tabor soils, 18 percent Tremona soils, 12 percent Chazos soils, and 45 percent minor soils.

Tabor soils typically have a surface layer of brown fine sandy loam about 9 inches thick. The subsurface layer is 6 inches of very pale brown fine sandy loam. The subsoil is 47 inches of clay that is yellowish brown in the upper part and light gray in the lower part. The underlying layer is light brownish gray clay to a depth of 69 inches.

Tremona soils typically have a surface layer of dark brown loamy fine sand about 6 inches thick. The subsurface layer is 20 inches of light brown loamy fine sand that is gravelly in the lower part. The upper 22 inches of the subsoil is grayish brown clay, and the lower 7 inches is light gray sandy clay. The underlying layer is dark yellowish brown clay to a depth of 70 inches.

Chazos soils typically have a surface layer of brown loamy fine sand about 8 inches thick. The subsurface layer is 7 inches of yellowish brown loamy fine sand. The subsoil is 40 inches of clay that is mottled with browns in the upper part and is light gray in the lower part. The underlying layer is light gray clay.

Minor in this association are Axtell, Crockett, Lufkin, Rader, Styx, and Straber soils. Gently sloping to sloping, loamy Axtell and Crockett soils are on side slopes and breaks. Nearly level to gently sloping, loamy Lufkin soils are in slight depressions and on lower parts of side slopes. Nearly level to gently sloping, loamy Rader soils are on divides and broad flats. Gently sloping, sandy Styx and Straber soils are on tops and sides of ridges.

This association is used mainly for range and pasture. Most areas of range are wooded. Some areas are cropped to corn, cotton, forage sorghum, grain sorghum, small grains, and truck crops. The major limitations for urban uses are the slow to very slow permeability and the shrink-swell potential.

5. Kenney-Tabor-Chazos association

Gently sloping to sloping, well drained and moderately well drained, sandy and loamy soils

This association consists of Kenney soils on ridges and side slopes, Tabor soils on foot slopes and hillsides, and Chazos soils on ridges and breaks. The native vegetation was mainly tall bluestem, indiangrass, shrubs, and scattered oak.

This association makes up about 7 percent of the survey area. It is about 31 percent Kenney soils, 15 percent Tabor soils, 8 percent Chazos soils, and 46 percent minor soils.

Kenney soils typically have a surface layer of brown loamy fine sand about 8 inches thick. The subsurface layer is 54 inches of pale brown and very pale brown loamy fine sand. The subsoil is red sandy clay loam to a depth of 80 inches.

Tabor soils typically have a surface layer of brown fine sandy loam 9 inches thick. The subsurface layer is 6 inches of very pale brown fine sandy loam. The subsoil is 47 inches of clay that is yellowish brown in the upper part and light gray in the lower part. The underlying layer is light brownish gray clay to a depth of 69 inches.

Chazos soils typically have a surface layer of brown loamy fine sand about 8 inches thick. The subsurface layer is 7 inches of yellowish brown loamy fine sand. The subsoil is 40 inches of clay that is mottled with browns in the upper part and is light gray in the lower part. The underlying layer is light gray clay.

Minor in this association are Axtell, Monaville, Nahatche, Rader, Styx, and Tremona soils. Gently sloping to sloping, loamy Axtell soils are on ridges and hillsides. Gently sloping, sandy Monaville and Styx soils are on higher ridges and hills. Nearly level, loamy Nahatche soils are on flood plains. Nearly level to gently sloping, loamy Rader soils are on broad divides and flats. Gently sloping to sloping, sandy Tremona soils are on side slopes and ridges.

This association is used mainly for pasture and crops. The major pasture grasses are coastal bermudagrass and bahiagrass. The major crops are watermelons and other truck crops rotated with corn and peanuts. Most wooded areas are used for grazing. Some areas are being developed as homesites. Shrink-swell potential and very slow permeability are limitations in some places.

6. Catilla-Tremona association

Nearly level to sloping, moderately well drained and somewhat poorly drained, sandy soils

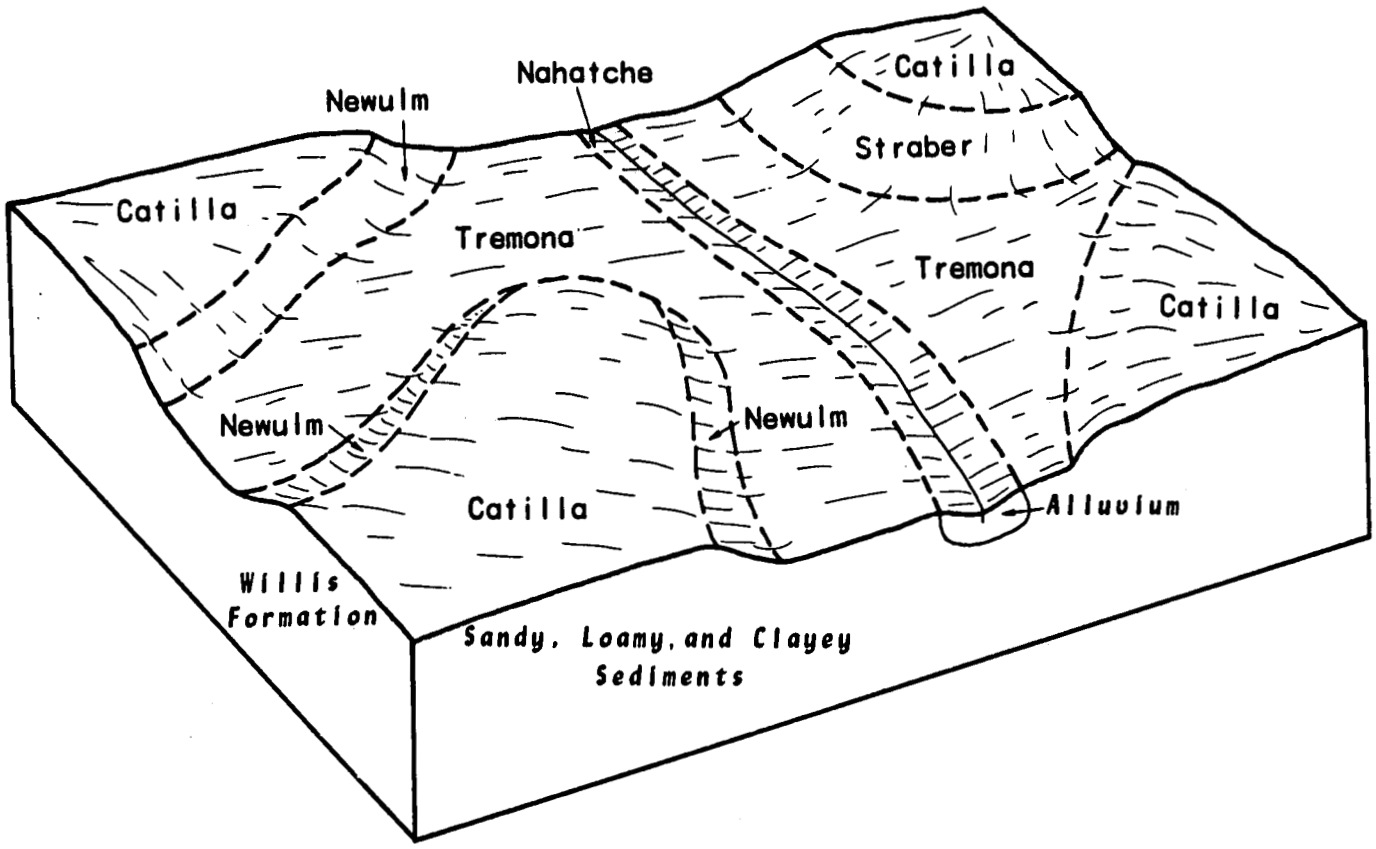


Figure 2.—Pattern of soils in the Catilla-Tremona association.

This association consists of Catilla soils on undulating uplands and Tremona soils on foot slopes (fig. 2). The native vegatation was bluestems and scattered hardwoods.

This association makes up 7 percent of the survey area. It is about 33 percent Catilla soils, 22 percent Tremona soils, and 45 percent minor soils.

Catilla soils typically have a surface layer of dark brown loamy fine sand about 5 inches thick. The subsurface layer is 45 inches of loamy fine sand that is brown in the upper part and pale brown in the lower part. The subsoil, to a depth of 72 inches, is pale brown sandy clay loam that has red and yellowish brown mottles.

Tremona soils typically have a surface layer of dark brown loamy fine sand about 6 inches thick. The subsurface layer is 20 inches of light brown loamy fine sand that is gravelly in the lower part. The upper 22 inches of the subsoil is grayish brown clay, and the lower 7 inches is light gray sandy clay. The underlying layer is dark yellowish brown clay to a depth of 70 inches.

Minor in this association are Newulm, Straber, and Tabor soils. Gently sloping, sandy Newulm soils are on tops and sides of hills. Gently sloping to sloping, sandy Straber soils and gently sloping, loamy Tabor soils are on hillsides and foot slopes.

This association is used mainly for pasture and wooded range. The major pasture grasses are coastal bermudagrass and bahiagrass. Range is mostly tall grasses with yaupon and hardwoods. Some areas have been subdivided for homesites and recreational farms. The main limitations for crops are the low available water capacity and acidity.

clayey and loamy soils of flood plains

The associations in this group make up about 16 percent of the survey area. The major soils are in the Brazoria, Norwood, and Trinity series. These soils are nearly level to gently sloping. Most of these soils are flooded rarely to frequently. Some have a seasonal high

water table. Native vegetation is mainly mid and tall grasses.

Most areas of these soils are used for pasture, crops, or range. Corn, grain sorghum, forage sorghum, and small grains are grown.

7. Brazoria-Norwood association

Nearly level to gently sloping, somewhat poorly drained to well drained, clayey and loamy soils

This association consists of soils on broad flood plains along the Brazos River (fig. 3). Norwood soils are near the river channel and are slightly higher than the Brazoria soils. Some areas are subject to occasional flooding. The native vegetation was tall grasses and elm, hackberry, pecan, and other trees.

This association makes up about 13 percent of the survey area. It is 55 percent Brazoria soils, 15 percent Norwood soils, and 30 percent minor soils.

Brazoria soils typically have a surface layer of dark reddish brown clay about 20 inches thick. Below this is clay that is reddish brown in the upper part and dark reddish brown in the lower part to a depth of 80 inches.

Norwood soils typically have a surface layer of reddish brown silty clay loam about 16 inches thick. The upper 20 inches of the underlying layer is reddish brown silt loam, the next 16 inches is light reddish brown very fine sandy loam, and the lower part is dark reddish brown clay to a depth of 72 inches.

Minor in this association are Clemville, Nahatche, Oklared, and Sumpf soils. Nearly level, loamy Clemville and Oklared soils are on flood plains adjacent to river channels. Nearly level, loamy Nahatche soils are around the confluences of local streams and the Brazos River. Clayey Sumpf soils are in depressions in cut-off river meanders.

This association is used mainly for crops and pasture. Corn is the major crop. Many areas of pasture have been improved by planting bermudagrass. The areas subject to flooding are not suitable for urban uses. The other areas are limited by wetness and very slow permeability.

8. Trinity association

Nearly level, somewhat poorly drained, clayey soils

This association consists of soils on broad flood plains. These areas are subject to frequent flooding. The

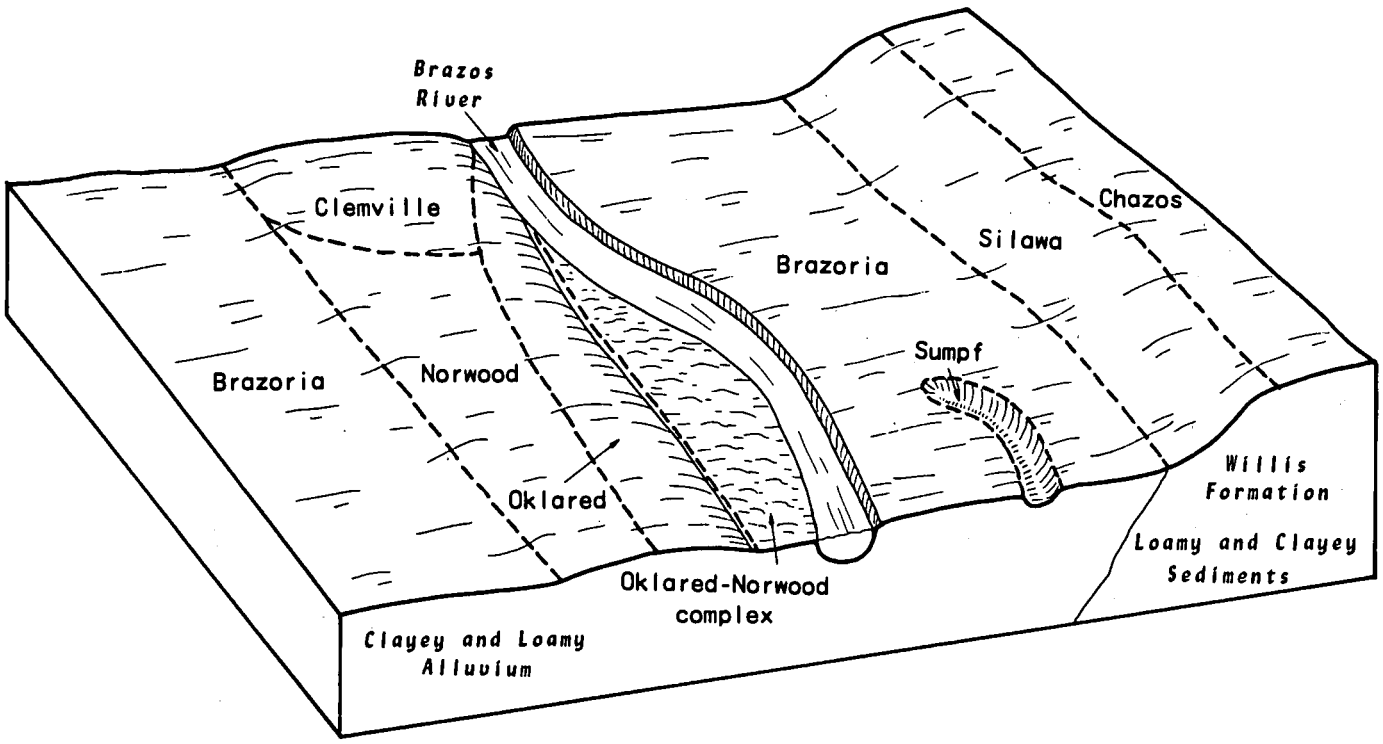


Figure 3.—Pattern of soils in the Brazoria-Norwood association.

native vegetation is tall grasses and scattered hardwoods.

This association makes up about 3 percent of the survey area. It is 70 percent Trinity soils and 30 percent minor soils.

Trinity soils typically have a surface layer of black clay about 16 inches thick. Below this is very dark gray and black clay to a depth of 65 inches.

Minor in this association are Bosque and Eufaula soils. The nearly level, loamy Bosque soils are on flood plains near the channels of large and small streams. Nearly level to gently sloping, sandy Eufaula soils are on low hillsides adjacent to the flood plains.

This association is used mainly for range and pasture. The areas are not suitable for crops and urban uses because of flooding. Some areas are used mostly for recreation and wildlife habitat. Other areas are used for grazing and hay; native grasses are used in some parts, and bermudagrass has been planted in others.

clayey and loamy soils of blacklands

The associations in this group make up about 15 percent of the survey area. The major soils are in the Frelsburg, Latium, Crockett, Klump, Carbengle, Brenham, Bleiblerville, Wilson, and Burleson series. These soils are nearly level to strongly sloping. Native vegetation is mid and tall grasses and scattered mottes of trees.

Most areas of these soils are used for pasture, range, and crops. Corn, grain sorghum, forage sorghum, and small grains are the main crops.

9. Frelsburg-Latium-Crockett association

Gently sloping to strongly sloping, well drained and moderately well drained, clayey and loamy soils

This association consists of gently sloping to sloping Frelsburg soils on upper parts of side slopes and ridges, gently sloping to strongly sloping Latium soils on hillsides, and gently sloping Crockett soils on lower parts of side slopes. The native vegetation was tall grasses with live oak, elm, and hackberry along breaks and along small streams.

This association makes up about 6 percent of the survey area. It is about 30 percent Frelsburg soils, 22 percent Latium soils, 15 percent Crockett soils, and 33 percent minor soils.

Frelsburg soils typically have a surface layer of very dark gray and dark gray clay about 15 inches thick. The next 40 inches is dark grayish brown clay. The underlying layer is light brownish gray clay to a depth of 65 inches.

Latium soils typically have a surface layer of olive gray clay about 4 inches thick. Below this is olive clay to a depth of 60 inches.

Crockett soils typically have a surface layer of dark grayish brown fine sandy loam about 8 inches thick. The subsoil is 53 inches of clay that is brown in the upper part, olive brown in the middle part, and yellowish red in the lower part. The underlying layer is yellowish red clay loam to a depth of 72 inches.

Minor in this association are Bleiblerville, Bosque, Brenham, Carbengle, Cuero, Klump, and Knolle soils. Gently sloping, clayey Bleiblerville soils are on ridges. Nearly level, loamy Bosque soils are on flood plains of the smaller streams. Gently sloping to sloping, loamy Brenham and Carbengle soils are on side slopes. Gently sloping to strongly sloping, loamy Cuero soils are on foot slopes. Gently sloping to sloping, loamy Klump soils are on ridges.

This association is used mainly for range and pasture. Some areas are cultivated to forage sorghum and small grains. The major limitations for urban uses are the shrink-swell potential and very slow permeability.

10. Klump-Carbengle-Brenham association

Gently sloping to sloping, well drained, loamy soils

This association consists of Klump soils on tops and upper sides of hills and gently sloping to sloping Carbengle and Brenham soils on hillsides and breaks. The native vegetation is tall prairie grasses with scattered hardwoods along drainageways.

This association makes up about 5 percent of the survey area. It is about 20 percent Klump soils, 20 percent Carbengle soils, 15 percent Brenham soils, and 45 percent minor soils.

Klump soils typically have a surface layer of dark brown sandy loam about 12 inches thick. The subsoil is sandy clay loam that is dark brown and mottled dark brown and dark red in the upper part, red in the middle part, and yellowish red in the lower part to a depth of 55 inches.

Carbengle soils typically have a surface layer of very dark grayish brown clay loam about 10 inches thick. The subsoil is 14 inches of light olive brown clay loam. Weakly cemented sandstone extends to a depth of 58 inches.

Brenham soils typically have a surface layer of very dark brown clay loam about 17 inches thick. The subsoil is silty clay loam that is light olive brown in the upper part and mottled browns and grays in the lower part to a depth of 60 inches.

Minor in this association are Bleiblerville, Crockett, Frelsburg, Knolle, and Latium soils. Gently sloping Bleiblerville soils are on ridgetops and broad divides. Gently sloping to sloping Crockett soils and gently sloping to strongly sloping Frelsburg and Latium soils are on side slopes and breaks. Gently sloping Knolle soils are on ridges.

This association is used mainly for range, pasture, and crops. The main crops are small grains and forage sorghum. The main pasture grasses are coastal

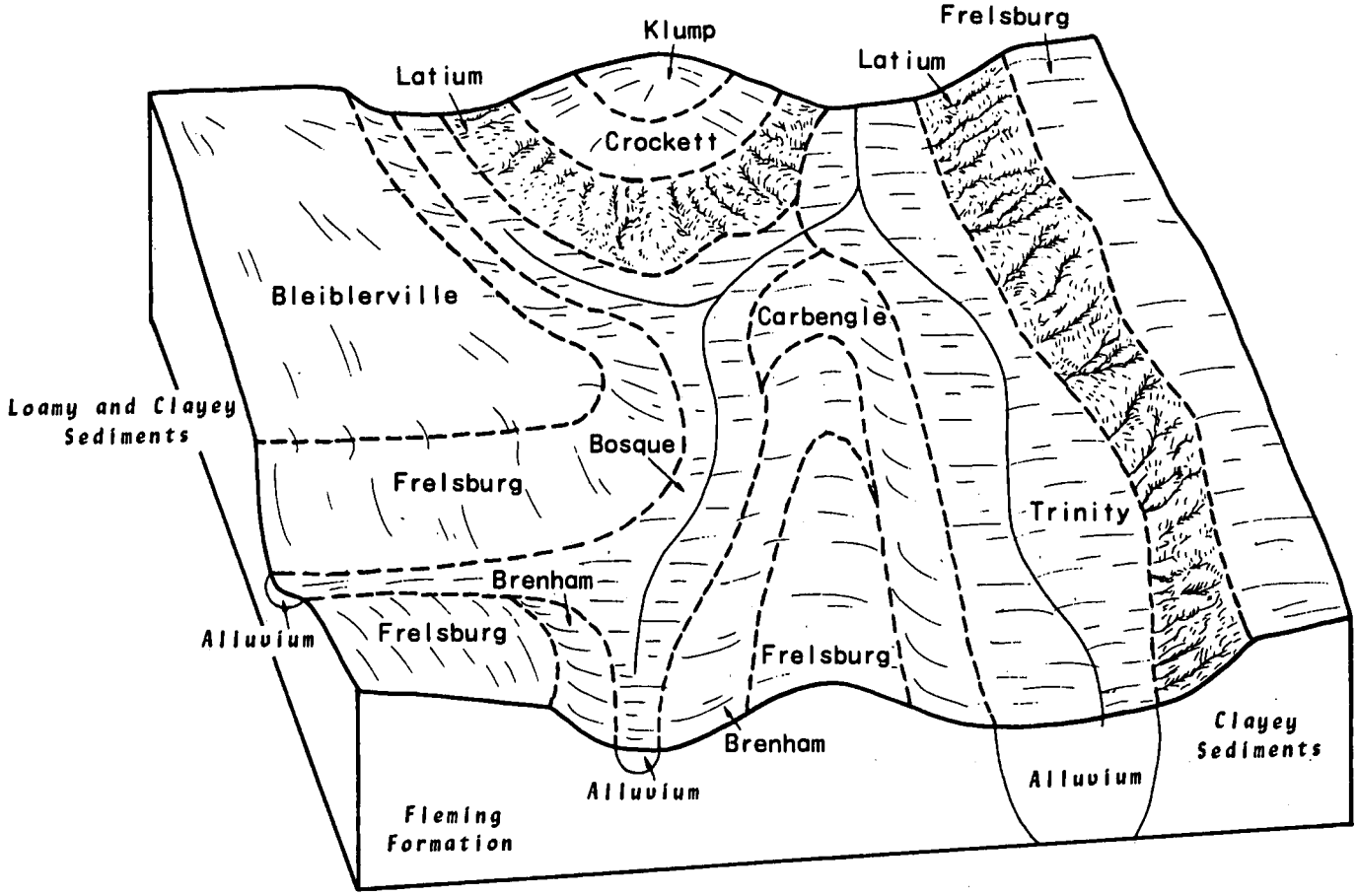


Figure 4.—Pattern of soils in the Frelsburg-Bleiblerville-Latium association.

bermudagrass and bahiagrass. This association is generally suited to urban uses; however, in some places slope, depth to rock, and shrink-swell potential are limitations.

11. Frelsburg-Bleiblerville-Latium association

Gently sloping to strongly sloping, well drained and moderately well drained, clayey soils

This association consists of gently sloping to sloping Frelsburg soils on upper parts of side slopes and breaks, gently sloping Bleiblerville soils on ridges and divides, and gently sloping to strongly sloping Latium soils on hillsides (fig. 4). The native vegetation was tall grass prairie with live oak, elm, and hackberry along breaks and small streams.

This association makes up about 2 percent of the survey area. It is about 33 percent Frelsburg soils, 21 percent Bleiblerville soils, 13 percent Latium soils, and 33 percent minor soils.

Frelsburg soils typically have a surface layer of dark gray and very dark gray clay about 15 inches thick. The next 40 inches is dark grayish brown clay. The underlying layer is light brownish gray clay to a depth of 65 inches.

Bleiblerville soils typically have a surface layer of black clay about 18 inches thick. Below this to a depth of 70 inches is clay that is gray in the upper part and grayish brown in the lower part.

Latium soils typically have a surface layer of olive gray clay about 4 inches thick. Below this is olive clay to a depth of 60 inches.

Minor in this association are Bosque, Brenham, Carbengle, Crockett, Cuero, and Klump soils. Nearly level, loamy Bosque soils are on flood plains of local streams. Gently sloping to sloping, loamy Brenham, Carbengle, and Crockett soils are on side slopes and breaks. Gently sloping to sloping, loamy Cuero soils are

on footslopes. Gently sloping to sloping, loamy Klump soils are on ridges.

This association is used for pasture and crops. Some areas are in range. The major crops are forage sorghum, small grains, and corn. The major limitations for urban uses are shrink-swell potential and very slow permeability.

12. Wilson-Burleson association

Nearly level to gently sloping, somewhat poorly drained and moderately well drained, loamy and clayey soils

This association consists of soils on broad prairies. The native vegetation was tall-grass prairie.

This association makes up about 2 percent of the survey area. It is about 35 percent Wilson soils, 20 percent Burleson soils, and 45 percent minor soils.

Wilson soils typically have a surface layer of very dark gray clay loam about 7 inches thick. The upper 16 inches of the subsoil is dark gray silty clay, and the lower part is dark gray and dark grayish brown clay to a depth of 64 inches.

Burleson soils typically have a surface layer of very dark gray clay about 15 inches thick. Below this is very dark gray and dark grayish brown clay to a depth of 70 inches.

Minor in the association are Crockett, Mabank, and Tabor soils. Gently sloping to sloping, loamy Crockett soils are on breaks and side slopes. Nearly level to gently sloping, loamy Mabank soils are on broad flats and breaks. Gently sloping, loamy Tabor soils are on breaks and footslopes.

This association is used mainly for crops and range. A few areas are in pasture. The shrink-swell potential of the clayey soils and the restricted drainage limit urban uses.

clayey and loamy soils of prairies

The association in this unit makes up about 6 percent of the survey area. The major soils are in the Lake Charles, Midland, and Edna series. These soils are nearly level to gently sloping. Native vegetation is tall grasses.

Most areas of these soils are used for crops and pasture. Corn, cotton, grain sorghum, small grains, rice, and forage sorghum are the major crops. Urban use is expanding.

13. Lake Charles-Midland-Edna association

Nearly level to gently sloping, somewhat poorly drained and poorly drained, clayey and loamy soils

This association consists of soils on broad coastal prairies. The native vegetation was mostly tall bluestem.

This association makes up 6 percent of the survey area. It is about 50 percent Lake Charles soils, 30 percent Midland soils, 10 percent Edna soils, and 10 percent minor soils.

Lake Charles soils typically have a surface layer of black clay about 9 inches thick. The next 36 inches is very dark gray clay, and the next 17 inches is dark gray clay. The underlying layer is grayish brown clay to a depth of 69 inches.

Midland soils typically have a surface layer of dark grayish brown clay loam about 6 inches thick. The upper 48 inches of the subsoil is dark gray clay, and the lower 12 inches is grayish brown clay. The underlying layer is light brownish gray clay to a depth of 72 inches.

Edna soils typically have a surface layer of light brownish gray fine sandy loam about 8 inches thick. The subsoil is clay that is dark gray in the upper part, light brownish gray in the middle part, and light yellowish brown in the lower part to a depth of 65 inches.

Minor in this association are Aris, Katy, Hockley, and Wockley soils. Nearly level, loamy Aris and Katy soils are on broad flats. Nearly level to gently sloping, loamy Hockley and Wockley soils are on slightly higher ridges and flats.

This association is used mainly for crops and pasture. The major crops are corn, grain sorghum, small grains, and cotton on the clayey Lake Charles soils. Some rice is grown on Edna and Midland soils. Pastures are mostly native grasses, but some are coastal bermudagrass and bahiagrass. The main limitations for urban uses are the shrink-swell potential, wetness, and very slow permeability.

sandy and loamy soils of timberlands

The associations in this group make up about 5 percent of the survey area. The major soils are in the Depcor, Splendora, Boy, Conroe, and Landman series. These soils are nearly level to strongly sloping. Native vegetation included tall grasses, pine, and hardwoods.

Most areas of these soils are used for woodland or pasture. Some areas are cropped to corn or truck crops. Urban use is expanding.

14. Depcor-Splendora-Boy association

Nearly level to gently sloping, moderately well drained and somewhat poorly drained, sandy and loamy soils

This association consists of gently sloping Depcor soils on the middle and lower parts of side slopes, nearly level Splendora soils on flats and near streams, and gently sloping Boy soils on ridgetops (fig. 5). The native vegetation is shortleaf and loblolly pine, post oak, water oak, pin oak, and other hardwoods with an understory of shrubs and grasses.

This association makes up about 4 percent of the survey area. It is about 25 percent Depcor soils, 15

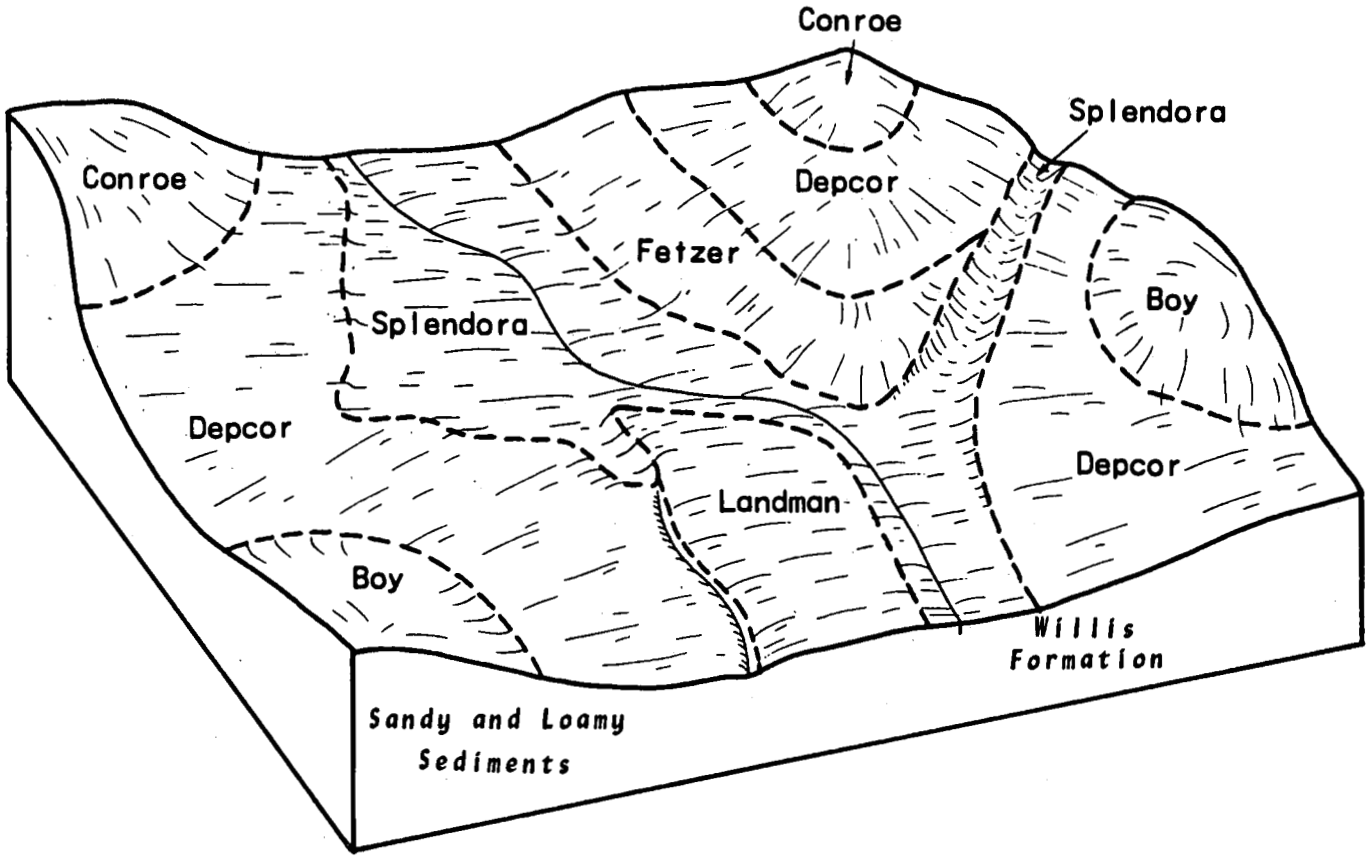


Figure 5.—Pattern of soils in the Depcor-Splendora-Boy association.

percent Splendora soils, 12 percent Boy soils, and 48 percent minor soils.

Depcor soils typically have a surface layer of grayish brown loamy fine sand about 6 inches thick. The subsurface layer is 16 inches of pale brown loamy fine sand. The subsoil, to a depth of 72 inches, is sandy clay loam that is yellowish brown in the upper part and is mottled gray with shades of gray, yellow, and red in the lower part.

Splendora soils typically have a surface layer of fine sandy loam, about 13 inches thick, that is light brownish gray in the upper part and pale brown in the lower part. The subsoil, to a depth of 60 inches, is sandy clay loam that is grayish brown in the upper part and light gray in the lower part.

Boy soils typically have a surface layer of grayish brown loamy fine sand about 4 inches thick. The subsurface layer is 41 inches of very pale brown loamy fine sand. The subsoil, to a depth of 72 inches, is sandy clay loam that is gray in the upper part and light gray in the lower part.

Minor in this association are Annona, Conroe, Fetzer, Landman, Larue, Nahatche, and Segno soils. Nearly level to gently sloping, loamy Annona soils are on tops and sides of hills. Gently sloping, sandy Conroe soils are on ridgetops. Gently sloping, sandy Fetzer soils are on footslopes. Gently sloping to sloping, sandy Landman and Larue soils are on terraces and hillsides adjacent to local streams. Gently sloping, loamy Segno soils are on side slopes and ridges.

This association is used mainly for woodland and pasture. Many areas have been developed as homesites. The soils are suited to most crops grown in the area. The major limitation to urban uses is wetness of some soils.

15. Conroe-Landman association

Gently sloping to strongly sloping, moderately well drained, sandy soils

This association consists of gently sloping Conroe soils on hilltops and ridges and gently sloping to strongly

sloping Landman soils on foot slopes. The native vegetation was shortleaf and loblolly pine, post oak, water oak, pin oak, hickory, and other hardwoods with an understory of shrubs and grasses.

This association makes up about 1 percent of the survey area. It is about 45 percent Conroe soils, 15 percent Landman soils, and 40 percent minor soils.

Conroe soils typically have a surface layer of brown loamy fine sand about 6 inches thick. The subsurface layer is 16 inches of light yellowish brown gravelly loamy fine sand. The subsoil is yellowish brown sandy clay in the upper part and clay mottled with shades of red, brown, and gray in the lower part to a depth of 70 inches.

Landman soils typically have a surface layer of grayish brown loamy fine sand about 6 inches thick. The subsurface layer is 59 inches of light brown loamy fine sand. The subsoil is sandy clay loam that is reddish yellow in the upper part and strong brown in the lower part to a depth of 80 inches.

Minor in this association are Boy, Larue, and Nahatche soils. Gently sloping, sandy Boy soils are on ridgetops. Gently sloping to strongly sloping, sandy Larue soils are on stream terraces and hillsides adjacent to streams. Nearly level, loamy Nahatche soils are on flood plains of local streams.

This association is used mainly for woodland. Most of the soils are suitable for crops. Some areas are in pasture. Many areas have been subdivided for homesites. The main limitations for urban uses are the sandy texture and wetness.

detailed soil map units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and management of the soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Hockley fine sandy loam, 1 to 3 percent slopes, is one of several phases in the Hockley series.

Some map units are made up of two or more major soils. These map units are called soil complexes.

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Oklared-Norwood complex, frequently flooded, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

AnA—Annona fine sandy loam, 0 to 1 percent slopes. This deep, nearly level soil is on ancient stream terraces. Areas are irregularly shaped and range from 10 to 300 acres in size. Slope averages just under 1 percent.

Typically, the surface layer is pale brown fine sandy loam about 8 inches thick. The upper part of the subsoil is 20 inches of yellowish red clay with grayish brown and red mottles, the middle part is dark grayish brown clay, and the lower part is yellowish brown clay to a depth of 65 inches. The underlying material is brown clay to a depth of 75 inches. This soil is strongly acid in the upper part and grades to moderately alkaline in the lower part.

This soil is somewhat poorly drained. A high water table is between depths of 2 and 4 feet for long periods during winter. Surface runoff is slow. Permeability is very slow. Available water capacity is high. This soil is difficult to till at most moisture levels. Roots have difficulty penetrating the clayey subsoil. The erosion hazard is slight.

Included with this soil in mapping are small areas of Depcor, Splendora, and Segno soils. Included also are small areas of gently sloping Annona soils. Included soils make up less than 15 percent of any mapped area.

This soil is used mainly for pasture and woodland.

This soil is moderately well suited to pasture. Some pastures are in native grasses and some are in improved grasses such as bermudagrass and bahiagrass.

This soil is moderately well suited to small grains, forage sorghum, and corn. The soil is difficult to work, especially when it is dry and crusty and hard. Leaving crop residue on the surface helps to conserve moisture. Seasonal wetness is a problem.

If used for grazing, this soil produces moderate yields of native forage. Planned grazing and brush control increase plant vigor and production of grazable forage.

The soil is poorly suited to urban and recreational uses. Shrink-swell properties, seasonal wetness, and

very slow permeability are the main limitations and can be overcome by proper design.

The soil is in capability subclass IIIw.

AnC—Annona fine sandy loam, 1 to 5 percent slopes. This deep, gently sloping soil is on ancient stream terraces. Areas are irregularly shaped and range from 10 to 100 acres in size. Slope averages about 2 percent.

Typically, the surface layer is about 8 inches of pale brown fine sandy loam. The subsoil is clay that is yellowish red in the upper part, dark grayish brown and yellowish brown in the middle part, and brown in the lower part to a depth of 15 inches; the subsoil is mottled in shades of gray and brown. Reaction is strongly acid in the surface layer and grades to moderately alkaline in the lower part.

This soil is somewhat poorly drained. A high water table is between depths of 2 and 4 feet for long periods during winter. Surface runoff is slow. Permeability is very slow. Available water capacity is high. The soil is difficult to work at most moisture levels. Roots have difficulty penetrating the clayey subsoil. The erosion hazard is moderate.

Included with this soil in mapping are small areas of Depcor, Segno, and Conroe soils. Included also are small areas of nearly level Annona soils. Included soils make up less than 15 percent of any mapped area.

This soil is used mainly for woodland. A few areas are in pasture. Native grasses and hardwoods are the most common vegetation.

The soil is moderately well suited to pasture. Some pastures are in native grasses. A few areas are in improved bermudagrass and bahiagrass.

The soil is moderately well suited to small grains and forage sorghum. Some corn is grown. The soil is difficult to work and is crusty and hard when dry. Leaving crop residue on the surface helps to conserve moisture, control erosion, and improve tilth. Contour farming and terraces also help to control erosion.

If used for grazing, this soil produces moderate amounts of forage. Management should include stocking at proper rates and planned grazing.

The soil is poorly suited to urban and recreational uses. Shrink-swell properties, seasonal wetness, and very slow permeability are the main limitations and can be overcome by proper design.

This soil is in capability subclass IIIe.

ArA—Aris fine sandy loam, 0 to 1 percent slopes. This deep, nearly level soil is on uplands. Areas are irregularly shaped and range from 5 to 400 acres in size. Slope is mainly less than 0.5 percent.

Typically, the surface layer is about 16 inches of light brownish gray fine sandy loam with brown mottles. The upper part of the subsoil is 12 inches of grayish brown sandy clay loam with yellowish brown mottles. The lower part of the subsoil, to a depth of 70 inches, is clay that is dark grayish brown in the upper part grading to light gray and is mottled with yellowish brown throughout. Reaction is medium acid in the surface layer, slightly acid in the upper part of the subsoil, and medium acid in the lower part.

This soil is somewhat poorly drained. A perched water table is between depths of 0.5 and 2.0 feet during winter and spring. Surface runoff is slow. Permeability is very slow. Available water capacity is medium. The soil may be difficult to work when the soil is saturated. The erosion hazard is slight.

Included with this soil in mapping are areas of Katy, Wockley, Kuy, Waller, and Edna soils. Included soils make up less than 15 percent of any mapped area.

This soil is used mainly for crops and pasture.

Rice does well on this soil, but other crops such as corn and soybeans may require drainage.

This soil is moderately well suited to pasture. Some areas are in improved bermudagrass and bahiagrass. Some areas may require drainage.

If used for range, this soil produces large amounts of grazable forage. Management should include stocking at proper rates and planned grazing.

The soil is poorly suited to urban and recreational uses. The main limitations are shrink-swell properties, wetness, and very slow permeability.

The soil is in capability subclass IIIw and Loamy Prairie range site.

AxC—Axtell fine sandy loam, 1 to 5 percent slopes. This deep, gently sloping soil is on uplands on ancient stream terraces. Areas are irregularly shaped and range from 10 to 100 acres in size. Slope averages 3 percent.

Typically, the surface layer is fine sandy loam about 8 inches thick; it is dark grayish brown in the upper part and brown in the lower part. The upper 14 inches of the subsoil is yellowish red clay with light gray mottles, the next 14 inches is yellowish brown and light gray mottled clay, the next 12 inches is light brownish gray clay with yellowish brown mottles, and the lower part is light brownish gray clay to a depth of 60 inches. The soil is medium acid in the surface layer and grades to moderately alkaline in the lower part.

This soil is moderately well drained. Surface runoff is medium. Permeability is very slow. Available water capacity is medium. This soil tends to be droughty. This soil is difficult to till, and plant roots have difficulty penetrating the clayey subsoil. The erosion hazard is severe.

Included with this soil in mapping are small areas of Lufkin, Rader, Tabor, and Tremona soils. Also included are small areas of nearly level Axtell soils and a few

small eroded areas. Included soils make up less than 15 percent of any mapped area.

This soil is used mainly for range or pasture. A few areas are used for crops, mainly small grains, forage sorghum, corn, and peanuts.

This soil is moderately well suited to pasture. Some areas are in common bermudagrass, improved bermudagrass, and bahiagrass.

This soil is poorly suited to crops. The soil is droughty and difficult to work. Leaving crop residue on the surface helps to maintain organic matter content and reduce erosion. Cover crops are beneficial. Terracing and contour farming also help to control erosion.

If used for range, this soil produces moderate amounts of grazable forage. Systems that rotate and defer grazing increase plant vigor and production.

The soil is poorly suited to urban and recreational uses. Shrink-swell properties, very slow permeability, and low strength, which affects roads and streets, are the main limitations.

The soil is in capability subclass IVe and Claypan Savannah range site.

AxC2—Axtell fine sandy loam, 2 to 5 percent slopes, eroded. This deep, gently sloping, eroded soil is on uplands on ancient stream terraces. Areas are irregular in shape and mostly follow old field boundaries. The areas are 5 to 40 acres in size. Slope averages 4 percent.

Sheet erosion has removed more than half of the surface layer in most areas. In a few places, the subsoil is exposed at the surface, and there are some rills and shallow gullies that can be crossed with farm equipment.

Typically, the surface layer is about 4 inches of brown fine sandy loam. The subsoil is 48 inches of clay that is red with gray mottles in the upper part, yellowish brown with gray mottles in the middle part, and dark yellowish brown in the lower part. The underlying material is yellowish brown clay loam to a depth of 65 inches. Reaction is medium acid in the surface layer and grades to moderately alkaline in the lower part.

This soil is moderately well drained. Surface runoff is medium. Permeability is very slow. Available water capacity is medium. This soil tends to be droughty. This soil is difficult to work, and plant roots have difficulty penetrating the clayey subsoil. The erosion hazard is severe.

Included with this soil in mapping are small areas of Lufkin, Rader, Silawa, and Tabor soils. Also included are a few areas of noneroded Axtell soils. Included soils make up less than 15 percent of any mapped area.

This soil is used mainly for range. Some areas are in pasture. Most areas were once in crops.

This soil is moderately well suited to pasture. Some areas are in improved grasses such as bermudagrass and bahiagrass.

This soil is poorly suited to crops. A few areas are farmed to small grains and forage sorghum. The soil is droughty, and much of the surface layer has eroded, lowering fertility. Leaving crop residue on the surface helps to maintain organic matter content and reduces erosion. Cover crops are beneficial. Terraces and contour farming also help to control erosion.

If used for range, this soil produces small amounts of grazable forage. Systems that rotate grazing increase plant vigor and production.

The soil is poorly suited to urban and recreational uses. Slope, shrink-swell properties, erosion, and very slow permeability are the main limitations.

The soil is in capability subclass IVe and Claypan Savannah range site.

AxD—Axtell fine sandy loam, 5 to 8 percent slopes. This deep, sloping soil is on upland side slopes and breaks on ancient stream terraces. Areas are irregularly shaped and follow the contour of the landscape. The areas range from 5 to 50 acres in size. Slope averages about 7 percent.

Typically, the soil has a surface layer of fine sandy loam about 7 inches thick; it is brown in the upper part and light yellowish brown in the lower part. The upper 18 inches of the subsoil is red clay with grayish brown mottles, the next 21 inches is light brownish gray clay with yellowish brown mottles, and the lower 8 inches is grayish brown clay with yellowish brown mottles. The underlying material is white clay to a depth of 65 inches. Reaction is slightly acid in the upper part and grades to moderately alkaline in the lower part of the subsoil.

This soil is moderately well drained. Surface runoff is rapid. Permeability is very slow. Available water capacity is medium. This soil tends to be droughty. The erosion hazard is severe.

Included with this soil in mapping are small areas of Crockett, Silawa, Straber, and Tabor soils. A few areas of gently sloping Axtell soils and of eroded Axtell soils that have lost the surface layer are also included. These included soils make up less than 15 percent of any mapped area.

This soil is used mainly for range. A few areas are in crops and pasture. Some wooded areas are used only for wildlife habitat.

This soil is moderately well suited to pasture. A few areas grow coastal bermudagrass or bahiagrass.

This soil is not suited to crops because of slope, hazard of erosion, and droughtiness.

If used for range, this soil produces moderate amounts of grazable forage. Systems that rotate and defer grazing increase plant vigor and production.

The soil is poorly suited to urban and recreational uses. Slope, shrink-swell properties, and very slow permeability are the main limitations.

The soil is in capability subclass VIe and Claypan Savannah range site.

BbB—Bleiblerville clay, 1 to 3 percent slopes. This deep, gently sloping soil is on upland ridges. Areas are rounded to irregularly shaped and range from 10 to 200 acres in size. In undisturbed areas this soil has gilgai microrelief (fig. 6). Slope averages about 2 percent.

Typically, the surface layer is about 18 inches of black clay. The next 14 inches is gray clay. Below this, to a depth of 70 inches, is grayish brown clay with yellowish brown and dark grayish brown mottles. This soil is moderately alkaline and calcareous throughout.

This soil is moderately well drained. Surface runoff is medium. Permeability is very slow. Available water capacity is high. This soil is difficult to work when wet. When the soil is dry and cracked, water enters rapidly; but when the soil is wet, water enters only very slowly. The erosion hazard is moderate.

Included with this soil in mapping are small areas of Brenham, Carbengle, and Latium soils. Included soils make up less than 15 percent of any mapped area.

This soil is used mainly for crops and pasture. Some areas are in range, and a few areas are used as native grass meadows for hay.

This soil is well suited to pasture. Native grasses and improved grasses such as coastal bermudagrass and kleingrass are grown.

This soil is well suited to corn, grain sorghum, small grains, and forage sorghum. Leaving crop residue on the surface helps to control erosion and increase organic matter content. Terraces and contour farming also help to control erosion.

If used for range, this soil produces large amounts of grazable forage. Rotational grazing and proper stocking rates increase production.

This soil is poorly suited to urban and recreational uses. Shrink-swell properties, very slow permeability, and low strength, which affects roads and streets, are the main problems.

This soil is in capability subclass IIe and Blackland (Blackland Prairie) range site.

Figure 6.—Bleiblerville clay, 1 to 3 percent slopes, after a rain showing gilgai microrelief. Water is standing in the microdepressions.

Be—Bosque clay loam, frequently flooded. This deep, nearly level soil is on small flood plains along tributary streams. This soil is flooded for short periods at least once every two years. Areas are elongated and range from 10 to 200 acres in size. Slope is less than 1 percent.

Typically, the surface layer is very dark grayish brown clay loam about 25 inches thick. The subsoil is 10 inches of very dark grayish brown clay loam. The underlying material is 7 inches of grayish brown fine sandy loam over dark grayish brown fine sandy loam to a depth of 70 inches. This soil is moderately alkaline and calcareous throughout.

This soil is well drained. Surface runoff is slow. Permeability is moderate. Available water capacity is high. The rooting zone is deep. The erosion hazard is slight.

Included with this soil in mapping are small areas of Brenham, Cuero, Frelsburg, and Trinity soils. Also included are areas of soils that are similar to Bosque soils but that are not calcareous. Included soils make up less than 15 percent of any mapped area.

This soil is used mainly for pasture and range because of the hazard of flooding.

This soil is well suited to native or improved pasture, especially improved grasses such as coastal bermudagrass and kleingrass.

This soil is not suited to crops because of the flooding. It is subject to washing, scouring, and deposition of fresh alluvial sediment. Even so, a few areas are farmed intermittently to small grains and forage sorghum.

If used for range, this soil produces large yields of forage of mid and tall native grasses. Management should include stocking at proper rates, brush management, and weed control.

This soil is poorly suited to urban and recreational uses, mainly because of the flooding.

This soil is in capability subclass Vw and Loamy Bottomland range site.

BoC—Boy loamy fine sand, 1 to 5 percent slopes. This deep, gently sloping soil is on upland plains. Areas are irregularly shaped and range from 20 to 300 acres in size. Slope averages 2 percent.

Typically, the surface layer is grayish brown loamy fine sand about 4 inches thick. The subsurface layer is 41 inches of very pale brown loamy fine sand. The upper 10 inches of the subsoil is gray sandy clay loam with red and yellowish brown mottles, and the lower part, to a depth of 72 inches, is light gray sandy clay loam with strong brown mottles and plinthite nodules. Reaction is very strongly acid to strongly acid throughout.

This soil is somewhat poorly drained. A perched water table is between depths of 3.5 and 5.5 feet during winter and spring. Surface runoff is slow. Permeability is rapid in the surface layer but moderately slow in the subsoil. Available water capacity is low. The water erosion hazard is slight, and the wind erosion hazard is moderate.

Included with this soil in mapping are small areas of Conroe, Depcor, Fetzer, Splendora, and Waller soils. These included soils make up less than 15 percent of any mapped area.

This soil is used mainly for woodland and native pasture. Production of grazable forage plants is low under woodland canopy.

The soil is well suited to pasture, and some areas have been cleared and planted to improved bermudagrass and bahiagrass. The main management objective is control of pine seedlings.

The soil is well suited to crops. Watermelons and peanuts yield well. Leaving crop residue on the surface helps to maintain organic matter and control wind erosion.

If used for grazing, this soil produces moderate amounts of forage after trees have been thinned to allow grasses and forbs to grow. Management should include tree thinning, stocking at proper rates, and planned grazing.

The soil is moderately well suited to urban and recreational uses. Seasonal wetness and sandy texture are the main limitations.

The soil is in capability subclass IIIs.

BrA—Brazoria clay, 0 to 1 percent slopes. This deep, nearly level soil is on flood plains of the Brazos River. This soil is subject to flooding for short periods about once every 15 to 20 years. Areas are elongated and curved. Slope averages 0.5 percent.

Typically, the surface layer is 20 inches of dark reddish brown clay. The upper 25 inches of the subsoil is reddish brown clay, and the lower part is dark reddish brown clay to a depth of 80 inches. This soil is moderately alkaline and calcareous throughout.

This soil is somewhat poorly drained. A high water table is between depths of 1.0 and 3.0 feet during winter. Surface runoff is slow. Permeability is very slow. Available water capacity is high. The soil is difficult to work during extremes in moisture content. When the soil is dry and cracked, water enters rapidly; but when the soil is wet, water enters only very slowly. The erosión hazard is slight.

Included with this soil in mapping are small areas of Clemville, Norwood, and Oklared soils and a few areas of Brazoria clay, depressional. Included soils make up less than 15 percent of any mapped area.

This soil is used mainly for pasture and crops.

This soil is well suited to pasture. Some areas are in improved bermudagrass.

This soil is well suited to corn, soybeans, and forage sorghums. Seasonal wet periods sometimes delay planting. Listing or bedding in fall helps to overcome

wetness in spring. Surface drainage is needed in some areas.

If used for range, this soil produces large amounts of grazable forage. Management should include stocking at proper rates, controlled grazing, and brush control.

The soil is poorly suited to urban and recreational uses. The main limitations are wetness, very slow permeability, and the hazard of flooding.

This soil is in capability subclass IIw and Clayey Bottomland range site.

BrB—Brazoria clay, 1 to 3 percent slopes. This deep, gently sloping soil is on undulating flood plains of the Brazos River. These areas are subject to flooding once every 15 to 20 years. Areas range from 10 to 100 acres in size. Slope averages about 2 percent.

Typically, the surface layer is 20 inches of dark reddish brown clay. The upper 22 inches of the subsoil is dark reddish brown clay, the next 3 inches is yellowish red silt loam, and the lower part is dark reddish brown and yellowish red clay to a depth of 60 inches. The soil is moderately alkaline and calcareous throughout.

This soil is somewhat poorly drained. A high water table is between depths of 1.0 and 3.0 feet during winter. Surface runoff is medium. Permeability is very slow. Available water capacity is high. When dry, the soil is cracked and takes in water rapidly, but water moves through very slowly when the soil is wet. The erosion hazard is slight.

Included with this soil in mapping are small areas of Clemville, Norwood, and Oklared soils. Also included are a few small areas of Brazoria soils, depressional. These included soils make up less than 15 percent of any mapped area.

This soil is used for pasture and crops.

This soil is well suited to pasture. Improved bermudagrass and bahiagrass can produce high yields of forage.

This soil is well suited to crops. Corn and soybeans are the main crops. Cotton is well suited. Leaving crop residue on the surface helps to maintain organic matter content and tilth. Listing or bedding in fall helps to overcome wetness in early spring.

If used for range, this soil produces large amounts of forage of tall and mid native grasses with scattered hardwoods.

This soil is poorly suited to urban and recreational uses. The limitations include wetness, very slow permeability, and the hazard of flooding.

The soil is in capability subclass IIe and Clayey Bottomland range site.

Bs—Brazoria clay, depressional. This deep, nearly level soil is on concave flood plains adjacent to the Brazos River. This soil is slightly lower than surrounding soils and is subject to flooding for short periods about once in 1 to 5 years. Areas are irregularly shaped and range from 10 to 500 acres in size. Slope averages less than 1 percent.

Typically, the surface layer is 21 inches of clay that is dark reddish brown in the upper part and dark brown in the lower part. The subsoil is dark reddish brown clay to a depth of 60 inches. The soil is moderately alkaline and calcareous throughout.

This soil is somewhat poorly drained. It is ponded or has a high water table above a depth of 3.0 feet during winter. Surface runoff is slow. Permeability is very slow. Available water capacity is high. The soil is difficult to work because of seasonal wetness, ponding, and the clayey texture. The erosion hazard is slight.

Included with this soil in mapping are small areas of Norwood, Clemville, Oklared, and Sumpf soils. Also included are some areas of a soil that is similar to Brazoria soils but that is gray less than 20 inches below the surface. Included soils make up less than 15 percent of any mapped area.

This soil is used mainly for pasture and range. Some areas are in crops.

This soil is moderately well suited to pasture. Improved bermudagrass produces moderate yields. Many areas need surface drainage.

This soil is poorly suited to crops. Many areas would be good for crops if drained and leveled. The major crops are corn, soybeans, and cotton.

If used for range, this soil produces large yields of tall and mid native grasses. Management should include stocking at proper rates and planned grazing.

The soil is poorly suited to urban and recreational uses because of the hazard of flooding.

The soil is in capability subclass IIw and Clayey Bottomland range site.

BtD—Brenham clay loam, 3 to 8 percent slopes. This deep, gently sloping to sloping soil is on uplands. Areas are irregular in shape and range from 10 to 50 acres in size. Slope averages about 6 percent.

Typically, the surface layer is very dark brown clay loam about 17 inches thick. The upper 20 inches of the subsoil is light olive brown silty clay loam, and the lower part, to a depth of 60 inches, is silty clay loam mottled with shades of gray and brown. The soil is moderately alkaline and calcareous throughout.

The soil is well drained. Surface runoff is rapid. Permeability is moderately slow. Available water holding capacity is high. The erosion hazard is moderate.

Included with this soil in mapping are small areas of Bleiblerville, Carbengle, Cuero, Frelsburg, Klump, and Latium soils and a few areas of strongly sloping Brenham soils. Also included are areas of a soil that is similar to Brenham soils but that has a lighter colored surface layer. The included soils make up less than 15 percent of any mapped area.

This soil is used mainly for range and pasture. Small grains and forage sorghum are the main crops.

This soil is well suited to pasture. Some areas are in improved grasses such as bermudagrass and bahiagrass, but most areas are in native grasses.

Forage sorghum and small grains are well suited to this soil. Leaving crop residue on the surface helps to maintain organic matter content and control erosion. Terraces also help to control erosion.

If used for range, this soil produces large amounts of grazable forage. The climax vegetation is mainly tall and mid grasses.

This soil is moderately well suited to urban and recreational uses. Slope and shrink-swell properties are the main limitations.

The soil is in capability subclass IVe and Clay Loam range site.

BuA—Burleson clay, 0 to 1 percent slopes. This deep, nearly level soil is on ancient upland stream terraces. Areas are rounded and range from 10 to 300 acres in size. Slope averages about 0.5 percent.

Typically, this soil is very dark gray clay to a depth of about 62 inches. The underlying material is dark grayish brown clay to a depth of 70 inches. Reaction is moderately alkaline throughout.

This soil is moderately well drained. Surface runoff is medium. Permeability is very slow. Water enters rapidly when the soil is dry and cracked but very slowly when the soil is wet. The erosion hazard is slight.

Included with this soil in mapping are small areas of Crockett, Mabank, and Wilson soils. Also included are a few small areas of gently sloping Burleson soils. Included soils make up less than 15 percent of any mapped area.

This soil is used mainly for range or for crops. The main crops are corn, soybeans, forage sorghum, grain sorghum, and small grains.

This soil is well suited to pasture. Pasture needs weed control and proper stocking rates.

This soil is well suited to crops. Leaving crop residue on the surface improves tilth, maintains organic matter content, and helps to control erosion. Listing or bedding in fall helps to overcome wetness in spring. Some areas need surface drainage.

If used for range, this soil produces large yields of mid and tall native grasses. Management should include stocking at proper rates and planned grazing.

The soil is poorly suited to urban and recreational uses. The main limitations are shrink-swell properties, very slow permeability, and low strength, which affects roads and streets.

This soil is in capability subclass IIw and Blackland (Blackland Prairie) range site.

CaB—Carbengle clay loam, 1 to 3 percent slopes. This moderately deep, gently sloping soil is on upland ridges. Areas are irregular in shape and range from 10 to 100 acres in size. Slope averages 2.5 percent.

Typically, the surface layer is about 12 inches of very dark brown clay loam. The subsoil is 16 inches of light olive brown loam. The underlying material is weakly cemented sandstone to a depth of 60 inches. The soil is moderately alkaline and calcareous throughout.

This soil is well drained. Surface runoff is medium. Permeability is moderate. Available water capacity is low. The erosion hazard is moderate.

Included with this soil in mapping are small areas of Brenham, Cuero, Bleiblerville, Frelsburg, Klump, and Renish soils. Also included are areas of a soil that is similar to this Carbengle soil but that is fine sandy loam throughout. Included soils make up less than 15 percent of any mapped area.

This soil is used mainly for range and for crops.

This soil is well suited to pasture. Some areas are in improved bermudagrass or kleingrass.

The main crops are forage sorghum and small grains, which are well suited to this soil. Leaving crop residue on the surface helps to control erosion and improve tilth. Terraces and contour farming also help to control runoff and erosion.

If used for range, this soil produces moderate yields of mid and tall grasses. Management should include stocking at proper rates, brush control, and planned grazing.

This soil is moderately well suited to urban and recreational uses. The main limitation is depth to rock.

This soil is in capability subclass IIe and Clay Loam range site.

CaC—Carbengle clay loam, 3 to 5 percent slopes. This moderately deep, gently sloping soil is on upland ridges and side slopes. Areas are irregularly shaped and range from 10 to 200 acres in size. Slope averages about 4 percent.

Typically, the surface layer is about 10 inches of very dark grayish brown clay loam. The subsoil is 14 inches of light olive brown clay loam. The underlying material is weakly cemented sandstone to a depth of 58 inches. The soil is moderately alkaline throughout.

This soil is well drained. Surface runoff is medium. Permeability is moderate. Available water capacity is low. The erosion hazard is moderate.

Included with this soil in mapping are small areas of Brenham, Bleiblerville, Cuero, Frelsburg, Klump, and Renish soils. Also included are areas of a soil that is similar to this Carbengle soil but that is fine sandy loam throughout. Included soils make up less than 15 percent of any mapped area.

Most of this soil is used for range. A few areas are in pasture and crops.

This soil is suited to pasture of both native grass and improved grasses. A few areas are in coastal bermudagrass and kleingrass.

This soil is well suited to forage sorghum and small grains. Terraces and contour farming help to control runoff and erosion. Leaving crop residue on the surface helps to maintain organic matter content, control erosion, and maintain tilth.

If used for range, this soil produces moderate yields of native forage when properly managed. Management should include stocking at proper rates, brush control, and planned grazing.

This soil is moderately well suited to urban and recreational uses. The main limitations are slope and depth to bedrock.

This soil is in capability subclass IIIe and Clay Loam range site.

CaD—Carbengle clay loam, 5 to 8 percent slopes. This moderately deep, sloping soil is on uplands. Areas follow contours of hills and ridges. The areas are 10 to 75 acres in size. Slope averages about 7 percent.

Typically, the surface layer is about 8 inches of very dark grayish brown clay loam. The subsoil is dark brown and dark yellowish brown clay loam to a depth of 22 inches. The underlying material is weakly cemented sandstone. The soil is moderately alkaline throughout.

This soil is well drained. Surface runoff is medium. Permeability is moderate. Available water capacity is low. The erosion hazard is severe.

Included with this soil in mapping are small areas of Brenham, Bleiblerville, Cuero, Klump, and Renish soils. Also included are areas of a soil that is similar to this Carbengle soil but that is fine sandy loam throughout. Included soils make up less than 15 percent of any mapped area.

This soil is used mainly for range. A few areas are used for pasture or crops.

The soil is suited to pasture. Some areas are in improved bermudagrass; however, most are in native grasses.

This soil is fairly suited to forage sorghum and small grains. Terraces and contour farming help to control runoff and erosion. Leaving crop residue on the surface helps to maintain organic matter content, improve tilth, and control erosion.

If used for range, this soil produces moderate yields of native forage when properly managed. Management should include stocking at proper rates, planned grazing, and brush control.

The soils are moderately well suited to urban and recreational uses. The main limitations are slope and depth to bedrock.

This soil is in capability subclass IVe and Clay Loam range site.

CcD—Catilla loamy fine sand, 0 to 8 percent slopes. This deep, nearly level to sloping soil is on undulating uplands. Areas are irregularly shaped and range from 20 to 250 acres in size. Slope averages about 3 percent.

Typically, the surface layer is dark brown loamy fine sand about 5 inches thick. The subsurface layer is 45 inches of loamy fine sand that is brown in the upper part and pale brown in the lower. The subsoil, to a depth of 72 inches, is pale brown sandy clay loam with red and yellowish brown mottles. Reaction is medium acid in the surface and subsurface layers and strongly acid to very strongly acid in the subsoil.

This soil is moderately well drained. Surface runoff is very slow. Permeability is rapid in the surface layer and moderately slow in the subsoil. Available water capacity is low. The water erosion hazard is slight, and the wind erosion hazard is severe.

Included with this soil in mapping are small areas of Newulm, Straber, Tabor, and Tremona soils. Also included are areas of a soil that is similar to Catilla soils but that has a base saturation of less than 35 percent. Included soils make up less than 20 percent of any mapped area.

This soil is used mainly for range and pasture. Some areas are used as crops.

This soil is well suited to pasture. Many areas have been cleared of brush and are in improved bermudagrass, bahiagrass, and lovegrass.

This soil is moderately well suited to watermelons, corn, and peanuts. Leaving crop residue on the surface helps to control erosion, maintain organic matter content, and prevent wind erosion.

If used for range, this soil produces moderate yields of tall native grasses when properly managed. Management should include stocking at proper rates, brush control, and planned grazing.

This soil is moderately well suited to urban and recreational uses. The main limitation is the sandy surface layer. Cutbanks of excavations tend to cave during construction.

This soil is in capability subclass IIIe and Deep Sand Savannah range site.

ChC—Chazos loamy fine sand, 1 to 5 percent slopes. This deep, gently sloping soil is on uplands on ancient stream terraces. Areas are irregularly shaped and range from 10 to 100 acres in size. Slope averages about 3 percent.

Typically, the surface layer is about 8 inches of brown loamy fine sand. The subsurface layer is 7 inches of yellowish brown loamy fine sand. The upper 10 inches of the subsoil is mottled yellowish brown and grayish brown clay, the next 11 inches is light brownish gray clay with yellowish brown mottles, and the lower 19 inches is light

gray clay with yellowish brown mottles. The underlying material, to a depth of 66 inches, is light gray clay with strong brown mottles. The soil is medium acid to strongly acid in the surface and subsurface layers, medium acid in the upper part of the subsoil, and neutral in the lower part.

The soil is moderately well drained. Surface runoff is slow. Permeability is slow. Available water capacity is medium. The water erosion hazard is severe, and the wind erosion hazard is moderate.

Included with this soil in mapping are small areas of Axtell, Lufkin, Tabor, Silawa, and Tremona soils. Also included are small areas of nearly level Chazos soils. Included soils make up less than 15 percent of any mapped area.

This soil is used mainly for pasture or range. Some areas are cropped (fig. 7).

This soil is well suited to pasture. Many areas are in improved bermudagrass or bahiagrass.

This soil is well suited to corn, peanuts, and truck crops. Leaving crop residue on the surface helps to maintain organic matter content and reduce erosion. Cover crops also help to prevent wind erosion.

If used for range, this soil can produce moderate yields of tall native grasses under proper management such as stocking at proper rates, brush control, and planned grazing.

This soil is poorly suited to urban and recreational uses. The main limitations are shrink-swell properties and low strength, which affects roads and streets.

This soil is in capability subclass IIIe and Loamy Sand range site.

Figure 7.—Chazos loamy fine sand, 1 to 5 percent slopes; peanuts in foreground and corn in background.

ChD—Chazos loamy fine sand, 5 to 8 percent slopes. This deep, sloping soil is on upland ancient stream terraces. Areas are irregularly shaped and range from 10 to 100 acres in size. Slope averages about 6 percent.

Typically, the surface layer is brown and reddish yellow loamy fine sand about 15 inches thick. The upper 11 inches of the subsoil is clay mottled with light brownish gray, light yellowish brown, and red, the next 14 inches is light brownish gray and red clay, and the lower part is red sandy clay loam to a depth of 60 inches. Reaction is medium acid in the surface layer and slightly acid in the subsoil.

This soil is moderately well drained. Surface runoff is medium. Permeability is slow. Available water capacity is medium. The water erosion and wind erosion hazards are severe.

Included with this soil in mapping are small areas of Axtell, Silawa, Tabor, and Tremona soils. Also included are small eroded areas from which most of the sandy surface layer has been removed. Included soils make up less than 15 percent of any mapped area.

This soil is used mainly for range and pasture. Some areas have been cultivated and are now idle.

This soil is well suited to pasture. Many areas have been cleared and are in improved bermudagrass or bahiagrass.

This soil is poorly suited to crops, but some areas are farmed to small grain and forage sorghum. Leaving crop residue on the surface helps to maintain organic matter content and control erosion. Cover crops also help to control erosion.

If used for range, this soil can produce moderate yields of mid and tall native grasses under proper management such as stocking at proper rates, brush control, and planned grazing.

This soil is poorly suited to urban and recreational uses. The main limitations are slope, shrink-swell properties, and low strength, which affects roads and streets.

The soil is in capability subclass IVe and Loamy Sand range site.

Cm—Clemville silt loam, occasionally flooded. This deep, nearly level soil is on flood plains adjacent to the Brazos River. Areas are elongated and range from 10 to 500 acres in size. The soil is subject to flooding for short periods about once in 5 to 10 years. Slope is 0 to 1 percent.

Typically, the soil is reddish brown silt loam to a depth of about 25 inches. Below this is dark reddish brown clay to a depth of 60 inches. The soil is moderately alkaline and calcareous throughout.

This soil is well drained. Surface runoff is slow. Permeability is slow. Available water capacity is high. The clayey lower layers impede penetration of plant roots. The erosion hazard is slight.

Included with this soil in mapping are small areas of Brazoria, Norwood, and Oklared soils. Also included are a few small areas of Brazoria very fine sandy loam. Included soils make up less than 15 percent of any mapped area.

This soil is used mainly for crops and pasture. A few areas are in woodland.

This soil is well suited to pasture. Many areas were once cultivated and are now in common and improved bermudagrass.

This soil is well suited to corn, cotton, and grain sorghum. A few areas are used for truck crops, and a few areas have pecan orchards.

This soil is not suited to urban and recreational uses because of the hazard of flooding.

This soil is in capability subclass IIw and Loamy Bottomland range site.

CoC—Conroe loamy fine sand, 1 to 5 percent slopes. This deep, gently sloping soil is on hilltops. Areas are irregular to rounded and range from 10 to 400 acres in size.

Typically, the surface layer is about 6 inches of brown loamy fine sand. The subsurface layer is 16 inches of light yellowish brown loamy fine sand containing about 40 percent ironstone nodules. The subsoil is clay that is yellowish brown in the upper part and mottled light gray, yellowish brown, and red in the lower part to a depth of 70 inches. The subsoil contains 20 to 25 percent plinthite. The soil is medium acid in the upper part and grades to very strongly acid in the lower part.

This soil is moderately well drained. A perched water table is between depths of 2.0 and 3.5 feet during winter and spring. Surface runoff is slow. Permeability is slow. Available water capacity is medium. The rooting zone is deep, but penetration is inhibited by the gravelly layers. The erosion hazard is moderate.

Included with this soil in mapping are small areas of Boy, Depcor, Fetzer, Segno, and Splendora soils. Also included are a few small areas where the surface layer has been mined for ironstone gravel. Included soils make up less than 15 percent of any mapped area.

This soil is used mainly for woodland and pasture. A few areas are in crops.

This soil is well suited to pasture. Some areas have been cleared of timber and are in coastal bermudagrass or bahiagrass. Addition of lime helps to neutralize the acidity of this soil.

This soil is well suited to corn, forage sorghum, and peanuts. Leaving crop residue on the surface helps to maintain organic matter content and control erosion.

If used for grazing, this soil can produce moderate yields of native grass forage. Most areas are in

woodland with a dense canopy of pine and hardwoods; therefore, production of grazable forage is usually low.

This soil is moderately well suited to urban and recreational uses. The main limitations are the sandy surface texture and seasonal wetness.

This soil is in capability subclass IIIs.

CpC—Conroe soils, graded, 1 to 5 percent slopes. These deep, gently sloping soils are on upland ridges. Areas are irregularly shaped and range from 5 to 40 acres in size. Slope averages about 3 percent. The original gravelly surface layer has been removed for use as roadbase. The current surface layer is variable in texture. It is mostly gravelly loamy fine sand, gravelly sandy loam, or gravelly sandy clay loam.

Typically, the surface layer is grayish brown gravelly loamy fine sand about 3 inches thick. The subsoil is clay that is brownish yellow in the upper part and reticulately mottled with gray, yellow, and red in the lower part to a depth of 65 inches. The soil is very strongly acid throughout.

These soils are moderately well drained. A perched water table is between depths of 2.0 and 3.5 feet during winter and spring. Surface runoff is rapid. Permeability is slow. Available water capacity is medium. The rooting zone is deep, but roots do not easily penetrate the layers that have plinthite and ironstone gravel. The erosion hazard is severe.

Included with these soils in mapping are small areas of Fetzer, Depcor, Landman, Larue, and Waller soils. Also included are a few areas of strongly sloping Conroe soils. The included soils make up less than 15 percent of any mapped area.

These soils are used mainly for woodland or are left idle.

These soils are poorly suited to pasture, but some areas have been planted to improved pasture grasses. Lime and fertilizer are needed for establishment of pasture grasses.

If used for grazing, these soils can produce small amounts of native grass. Most areas eventually become woodland with a canopy of pine and hardwoods. Management for grazing includes thinning trees, planned grazing, and stocking at proper rates.

These soils are not suited to cultivation because most of the original surface layer has been removed and the present surface layer is very low in fertility, is gravelly, and has poor tilth.

Trees generally invade after mining and form a thin cover of pine with a few hardwoods. Growth is slow mainly because of the difficulty that roots have in penetrating the clayey subsoil.

These soils are poorly suited to urban and recreational uses. The limitations include the thin surface layer, slow permeability, and seasonal wetness.

These soils are in capability subclass IVe.

CrC—Crockett fine sandy loam, 1 to 5 percent slopes. This deep, gently sloping soil is on upland ridges and breaks. Areas are irregularly shaped and range from 5 to 200 acres in size.

Typically, the surface layer is dark grayish brown fine sandy loam about 8 inches thick. The upper 11 inches of the subsoil is brown clay with yellowish brown and red mottles, the next 31 inches is olive brown clay with dark grayish brown and yellowish brown mottles, and the lower 11 inches is yellowish red clay. The underlying material is yellowish red clay loam to a depth of 72 inches. Reaction is slightly acid in the surface layer and grades to mildly alkaline in the lower part.

This soil is moderately well drained. Surface runoff is medium. Permeability is very slow. Available water capacity is high. This soil is difficult to till at most moisture levels. Plant roots have difficulty penetrating the clayey subsoil. The erosion hazard is moderate.

Included with this soil in mapping are small areas of Burleson, Frelsburg, Mabank, Tabor, Tremona, and Wilson soils. Also included are small areas of Crockett soils that have been eroded. Included soils make up less than 20 percent of any mapped area.

This soil is used mainly for pasture and range.

This soil is well suited to pasture. Many areas that were once cultivated are now in coastal bermudagrass and bahiagrass. Some areas are in native grass. Pasture needs brush and weed control and fertilization.

This soil has fair suitability for corn, small grains, forage sorghum, and grain sorghum. Leaving crop residue on the surface helps to maintain organic matter content and control erosion. Terraces also help to control runoff and erosion.

If used for range, this soil can produce moderate yields of mid and tall native grasses when properly managed. Management should include stocking at proper rates, brush control, and planned grazing.

This soil is poorly suited to urban and recreational uses. The main limitations are shrink-swell properties, very slow permeability, and seasonal wetness.

This soil is in capability subclass IIIe and Claypan Prairie range site.

CrC2—Crockett fine sandy loam, 2 to 5 percent slopes, eroded. This deep, gently sloping soil is on upland ridges. Areas are irregularly shaped and generally coincide with boundaries of old fields. The areas range from 5 to 30 acres in size. Slopes are mostly 3 to 5 percent.

Sheet erosion has removed more than one-half of the surface layer from most areas. Rills are common and there are a few gullies 1 to 3 feet deep. In some places, the plow layer consists of a mixture of the original surface layer and subsoil material.

Typically, the surface layer is about 5 inches of pale brown fine sandy loam. The upper 10 inches of the subsoil is brown clay with gray and brown mottles, and the lower 40 inches is grayish brown clay with brownish yellow and strong brown mottles and a few concretions of calcium carbonate in the lower part. The underlying material, to a depth of 70 inches, is strong brown clay loam with brownish yellow and red mottles. This soil is slightly acid in the upper part and moderately alkaline in the lower part.

This soil is moderately well drained. Runoff is rapid. Permeability is very slow. Available water capacity is high. This soil is difficult to till at most moisture levels. Plant roots have difficulty penetrating the clayey subsoil. The erosion hazard is severe.

Included with this soil in mapping are small areas of Axtell, Frelsburg, Straber, Tabor, and Tremona soils. Also included are small areas of Crockett soils that are not eroded. Included soils make up less than 20 percent of any mapped area.

This soil is used mainly for pasture and range. A few areas are in crops. Most areas were formerly cropped.

This soil is moderately well suited to pasture. Many areas are in improved bermudagrass.

This soil is poorly suited to crops. The main crops are small grains and forage sorghum. Terraces and contour farming help to control erosion. Leaving crop residue on the surface helps to maintain organic matter content and control erosion.

If used for range, this soil produces small amounts of forage. Management should include stocking at proper rates, planned grazing, and brush control.

This soil is poorly suited to urban and recreational uses. The main limitations are very slow permeability, shrink-swell properties, and seasonal wetness.

This soil is in capability subclass IVe and Claypan Prairie range site.

CrD—Crockett fine sandy loam, 5 to 8 percent slopes. This deep, sloping soil is on upland ridges. Areas are elongated and follow breaks between landforms of different elevations. The areas range from 10 to 100 acres in size.

Typically, the surface layer is grayish brown, slightly acid fine sandy loam about 8 inches thick. The upper part of the subsoil is 24 inches of strong brown, mildly alkaline clay with gray and yellowish red mottles, and the lower 18 inches is grayish brown, moderately alkaline clay with yellowish brown mottles. The underlying material, to a depth of 70 inches, is light gray, moderately alkaline clay with brownish yellow mottles.

This soil is moderately well drained. Surface runoff is rapid. Permeability is very slow. Available water capacity is high. Plant roots have difficulty penetrating the clayey subsoil. The erosion hazard is severe.

Included with this soil in mapping are small areas of Axtell, Latium; Frelsburg, Straber, Tabor, and Tremona soils. Also included are a few areas of eroded Crockett soils. Included soils make up less than 15 percent of any mapped area.

This soil is used mainly for range. A few areas are in pasture.

This soil is suited to pasture. Improved bermudagrass and bahiagrass are the main grasses.

This soil is not suited to crops because of slope and the erosion hazard.

If used for range, this soil can produce moderate yields of mid and tall native grasses. Management should include stocking at proper rates, brush control, and planned grazing. Some areas are managed as native meadows for hay.

This soil is poorly suited to urban and recreational uses. The main limitations are very slow permeability and slope.

This soil is in capability subclass IVe and Claypan Prairie range site.

CuB—Cuero loam, 1 to 3 percent slopes. This deep, gently sloping soil is on footslopes of hills and ridges. Areas range from 5 to 30 acres in size. Slope averages about 2 percent.

Typically, the surface layer is very dark brown loam about 14 inches thick. The subsoil is 41 inches of sandy clay loam that is very dark grayish brown in the upper part, reddish brown in the middle part, and yellowish red in the lower part. The underlying material is strong brown fine sandy loam to a depth of 65 inches. The soil is mildly alkaline in the upper part and moderately alkaline in the lower part.

This soil is well drained. Surface runoff is slow. Permeability is moderate. Available water capacity is high. The erosion hazard is slight.

Included with this soil in mapping are small areas of Brenham, Carbengle, Crockett, Klump, Knolle, and Frelsburg soils. Also included are areas of a soil that is similar to Cuero soils but that has a more clayey subsoil. Included soils make up less than 15 percent of any mapped area.

This soil is used for pasture, range, and crops. Some areas are managed as native meadows for hay.

This soil is well suited to pasture. Many areas are in improved bermudagrass or kleingrass.

This soil is well suited to corn, small grains, and forage sorghum. Leaving crop residue on the surface helps to prevent erosion and maintain organic matter content. Terraces and contour farming also help to control runoff and erosion.

If used for range, this soil produces high yields of mid and tall native grasses. Management should include proper stocking, planned grazing, and brush control.

This soil is moderately well suited to urban and recreational uses. The main limitations are shrink-swell properties and low strength, which affects roads and streets. Slope limits some recreational uses.

This soil is in capability subclass IIe and Clay Loam range site.

CuC—Cuero loam, 3 to 5 percent slopes. This deep, gently sloping soil is on upland footslopes. Areas are rounded and range from 5 to 75 acres in size. Slope averages 4 percent.

Typically, the surface layer is about 23 inches of very dark brown, slightly acid loam. The upper 10 inches of the subsoil is dark brown, neutral sandy clay loam; the next 12 inches is strong brown, neutral sandy clay loam; and the lower part is strong brown, moderately alkaline clay loam to a depth of 60 inches.

This soil is well drained. Surface runoff is medium. Permeability is moderate. Available water capacity is high. The erosion hazard is moderate.

Included with this soil in mapping are small areas of Brenham, Carbengle, Crockett, Klump, Knolle, and Frelsburg soils. Also included are some areas of a soil that is similar to Cuero soils but that has a thinner surface layer and a more clayey subsoil. Included soils make up less than 15 percent of any mapped area.

This soil is used mainly for range and pasture. Some areas are in crops.

This soil is well suited to pasture. Many areas are in improved bermudagrass and bahiagrass.

This soil is well suited to wheat, oats, forage sorghum, and grain sorghum. Terraces and contour farming help to control erosion. Leaving crop residue on the surface helps to conserve moisture and maintain soil tilth and productivity.

If used for range, this soil produces high yields of tall and mid native grasses. Management should include proper stocking, planned grazing, and brush control.

This soil is moderately well suited to urban and recreational uses. The main limitations are shrink-swell properties and low strength, which affects roads and streets. Slope limits some recreational uses.

This soil is in capability subclass IIIe and Clay Loam range site.

CuD—Cuero loam, 5 to 8 percent slopes. This deep, sloping soil is on upland side slopes. Areas range from 5 to 75 acres in size and follow the contours of the landscape. Slope averages about 7 percent.

Typically, the surface layer is about 18 inches of dark brown, slightly acid loam. The upper 14 inches of the subsoil is dark reddish brown, neutral sandy clay loam, the next 18 inches is yellowish red, neutral sandy clay loam, and the lower 15 inches is yellowish red, mildly alkaline sandy clay loam. The underlying material is strong brown, moderately alkaline clay loam to a depth of 72 inches.

This soil is well drained. Surface runoff is medium. Permeability is moderate. Available water capacity is high. The erosion hazard is severe.

Included with this soil in mapping are small areas of Brenham, Carbengle, Crockett, Klump, Knolle, and Frelsburg soils. Also included are areas of a soil that is similar to Cuero soils but that has a more clayey subsoil. Included soils make up less than 15 percent of any mapped area.

The soil is used as range and pasture. A few areas are cultivated to small grains or forage sorghum.

This soil is well suited to pasture. Improved grasses such as coastal bermudagrass and kleingrass are suited to this soil.

This soil is moderately well suited to oats, wheat, forage sorghum, and other close-grown crops. Leaving crop residue on the surface helps to control erosion. Terraces and contour farming also help to control erosion.

If used for range, this soil produces large amounts of native grass forage. Management should include proper stocking, planned grazing, and brush control.

This soil is poorly suited to urban and recreational uses. The main limitations are moderate shrink-swell properties, slope, and low strength, which affects roads and streets.

This soil is in capability subclass IVe and Clay Loam range site.

DeC—Depcor loamy fine sand, 1 to 5 percent slopes. This deep, gently sloping soil is on uplands. Areas are irregularly shaped and range from 20 to 600 acres in size. Slope averages about 3 percent.

Typically, the surface layer is grayish brown loamy fine sand about 6 inches thick. The subsurface layer is 16 inches of pale brown loamy fine sand. The upper 18 inches of the subsoil is yellowish brown sandy clay loam with reddish and yellowish mottles, and the lower part, to a depth of 72 inches, is sandy clay loam that is reticulately mottled in shades of gray, yellow, and red. Reaction is medium acid in the subsurface layer and strongly acid in the rest of the soil.

This soil is moderately well drained. A perched water table is between depths of 2.0 and 3.5 feet during winter and spring. Surface runoff is slow. Permeability is slow. Available water capacity is medium. The water erosion hazard is slight. The wind erosion hazard is moderate.

Included with this soil in mapping are small areas of Conroe, Boy, Splendora, and Fetzer soils. Also included are areas of a soil that is similar to Depcor soils but that has a sandy surface layer less than 20 inches thick. Also included are a few small areas of sloping Depcor soils. Included soils make up less than 20 percent of any mapped area.

This soil is used mainly for woodland and pasture.

This soil is well suited to pasture. Improved grasses such as coastal bermudagrass and bahiagrass are suited to this soil. In most places, applications of lime improve production.

This soil is well suited to crops. Corn, peanuts, and small grains are the main crops. Leaving crop residue on the surface helps to maintain organic matter content and control erosion.

If used for grazing, this soil can produce large yields of tall native grasses. Most areas have a dense canopy of pine and hardwoods, and in these places forage production is low. Management includes brush control, proper stocking, and planned grazing.

This soil is moderately well suited to urban and recreational uses. The main limitations are sandy texture, seasonal wetness, and slope in some places.

This soil is in capability subclass IIIe.

DuD—Dutek loamy fine sand, 5 to 8 percent slopes. This deep, sloping soil is on ancient upland stream terraces. Areas are irregularly shaped and range from 5 to 20 acres in size. Slope averages about 6 percent.

Typically, the surface layer is yellowish brown loamy fine sand about 8 inches thick. The subsurface layer is 17 inches of light yellowish brown loamy fine sand. The upper 20 inches of the subsoil is sandy clay loam that is yellowish red in the upper part and strong brown in the lower part with yellowish red and red mottles. Below this to a depth of 72 inches the subsoil is strong brown fine sandy loam with red and yellowish red mottles. This soil is medium acid in the upper part and very strongly acid in the lower part.

This soil is well drained. Surface runoff is slow. Permeability is moderate. Available water holding capacity is medium. The water and wind erosion hazards are moderate.

Included with this soil in mapping are small areas of Kenney, Silawa, Straber, Styx, and Tremona soils. Included soils make up less than 20 percent of any mapped area.

This soil is used for pasture, crops, and range.

This soil is well suited to pasture. Coastal bermudagrass, bahiagrass, and weeping lovegrass are suited to this soil.

This soil is well suited to truck crops such as watermelons and to peanuts and corn. In many places, these crops are rotated with pasture. Leaving crop residue on the surface helps to conserve moisture and control erosion.

If used for range, this soil can produce moderate yields of tall native grasses. Management should include stocking at proper rates and planned grazing.

This soil is moderately well suited to urban and recreational uses. The main limitations are the sandy surface layer, slope, and seepage.

This soil is in capability subclass IIIe and Sandy range site.

EdA—Edna fine sandy loam, 0 to 1 percent slopes. This deep, nearly level soil is on broad uplands. Areas range from 20 acres to several hundred acres in size. Slope averages 0.5 percent.

Typically, the surface layer is about 8 inches of light brownish gray fine sandy loam. The subsoil extends to a depth of 65 inches. It is clay that is dark gray in the upper part grading to light brownish gray in the middle part and to light yellowish brown in the lower part. Reaction is medium acid in the upper part and grades to moderately alkaline in the lower part of the subsoil.

This soil is poorly drained. A perched water table is above a depth of 1.5 feet for long periods during winter and spring. Surface runoff is very slow. Permeability is very slow. Available water capacity is high. This soil is saturated for long periods in winter and early spring and is then difficult to till. The erosion hazard is slight.

Included with this soil in mapping are small areas of Midland, Lake Charles, and Katy soils. Included soils make up less than 15 percent of any mapped area.

This soil is used for crops, pasture, and range. The main crops are rice, soybeans, and corn.

This soil is moderately well suited to improved pasture. Coastal bermudagrass and bahiagrass are suited to this soil but may be difficult to establish because of surface crusting.

This soil is best suited to rice. Corn and soybeans have fair suitability. Drainage is needed in some areas. Plowing in fall helps to overcome seasonal wetness in early spring.

If used for range, this soil can produce moderate yields of native grasses. Management should include stocking at proper rates and planned grazing.

This soil is poorly suited to urban and recreational uses. The main limitations are wetness, shrink-swell properties, and very slow permeability.

This soil is in capability subclass IIIw and Claypan Prairie range site.

EdB—Edna fine sandy loam, 1 to 3 percent slopes. This deep, gently sloping soil is on broad uplands. Areas are irregularly shaped and range from 10 to 100 acres in size. Slope averages 2 percent.

Typically, the surface layer is dark grayish brown, medium acid fine sandy loam about 8 inches thick. The upper 8 inches of the subsoil is dark grayish brown, medium acid clay with olive brown mottles; below this the subsoil is clay that is gray in the upper part and light brownish gray in the lower part to a depth of 65 inches.

Grayish and brownish mottles occur throughout the subsoil. This soil is medium acid in the upper part and moderately alkaline in the lower part.

This soil is poorly drained. A perched water table is above a depth of 1.5 feet during winter. Surface runoff is slow. Permeability is very slow. Available water capacity is high. This soil is difficult to cultivate during long periods of wetness. The erosion hazard is slight.

Included with this soil in mapping are small areas of Katy, Lake Charles, and Midland soils. Included soils make up less than 15 percent of any mapped area.

This soil is used for pasture, crops, and range.

This soil is moderately well suited to pasture. Improved bermudagrass and bahiagrass are suited to this soil.

This soil is moderately well suited to small grains, rice, corn, and soybeans. Leaving crop residue on the surface helps to maintain tilth and organic matter content and prevent erosion.

If used for range, this soil can produce moderate yields of mid and tall native grasses under good management, which includes stocking at proper rates and planned grazing.

This soil is poorly suited to urban and recreational uses. The main limitations are shrink-swell properties, wetness, and very slow permeability.

This soil is in capability subclass IIIw and Claypan Prairie range site.

EuC—Eufaula fine sand, 0 to 5 percent slopes. This deep, gently sloping soil is on ancient upland stream terraces. Areas are irregular in shape and range from 10 to 150 acres in size. Slope is dominantly about 2 percent.

Typically, the surface layer is about 9 inches of brown, medium acid fine sand. The subsurface layer is 45 inches of yellowish brown, medium acid fine sand. Below this to a depth of 80 inches is light yellowish brown, medium acid loamy fine sand with common lamella of yellowish red sandy clay loam.

This soil is somewhat excessively drained. Surface runoff is very slow. Permeability is rapid. Available water capacity is low. Droughtiness limits crop production. The water erosion hazard is slight, and the wind erosion hazard is severe.

Included with this soil in mapping are small areas of Catilla, Kenney, Styx, and Sealy soils. Included also are areas of a soil that is similar to Eufaula soils but is loamy fine sand to a depth of 80 inches or more. The included soils make up less than 15 percent of any mapped area.

This soil is used for range and pasture.

This soil is moderately well suited to pasture. Improved bermudagrass, bahiagrass, and lovegrass are commonly grown.

This soil is moderately well suited to watermelons, truck crops, and small grains. Stripcropping helps to control wind erosion. Leaving crop residue on the surface by minimum tillage helps to control erosion and conserve moisture.

If used for range, this soil can produce small yields of tall grasses. Management should include stocking at proper rates, planned grazing, and brush control.

This soil is poorly suited to urban and recreational uses. The main limitations are sandy texture and seepage. Cutbanks of excavations tend to cave in. Slope limits some recreational uses.

This soil is in capability subclass IVe and Deep Sand range site.

FeC—Fetzer loamy fine sand, 1 to 5 percent slopes. This deep, gently sloping soil is on upland footslopes. Areas are elongated and follow drainage patterns. Areas range from 20 to 400 acres. Slope averages about 2 percent.

Typically, the surface layer is dark yellowish brown loamy fine sand about 6 inches thick. The subsurface layer is very pale brown loamy fine sand 22 inches thick. The subsoil is clay loam that is grayish brown in the upper part and light brownish gray in the lower part to a depth of 74 inches. Reaction is strongly acid in the surface layer and very strongly acid in the subsoil.

This soil is somewhat poorly drained. A perched water table is between depths of 1.5 and 3.5 feet during winter and spring. Surface runoff is slow. Permeability is slow. Available water capacity is medium. The water erosion hazard is slight, and the wind erosion hazard is moderate.

Included with this soil in mapping are small areas of Boy, Conroe, Depcor, Splendora, Waller, and Wockley soils. Also included are a few areas of Fetzer soils in depressions. Included soils make up less than 15 percent of any mapped area.

This soil is used for woodland and pasture.

This soil is well suited to pasture. Improved bermudagrass and bahiagrass are the main grasses.

Corn, peanuts, truck crops, and small grains are well suited to this soil. Minimum tillage leaves most crop residue on the surface and helps to control erosion.

If used for grazing, this soil can produce large yields of native tall grasses. However, most areas have a dense canopy of pine and hardwoods that causes grass production to be low. Proper management includes thinning trees, stocking at proper rates, and planned grazing.

This soil is poorly suited to urban and recreational uses. The main limitations are wetness and slow permeability. In some places, slope limits recreational uses.

This soil is in capability subclass IIIs.

FrB—Frelsburg clay, 1 to 3 percent slopes. This deep, gently sloping soil is on upland hillsides. Areas are elongated and follow the contour of the landscape. The

areas range from 5 to 100 acres in size. Slope is mostly 2 to 3 percent.

Typically, the surface layer is about 18 inches of dark gray clay. The next 24 inches is dark grayish brown clay. Below this to a depth of 65 inches is light brownish gray and grayish brown clay. The soil is moderately alkaline and calcareous throughout.

This soil is well drained. Surface runoff is medium. Permeability is very slow. Available water capacity is high. Water enters rapidly when the soil is dry and cracked but very slowly when it is wet. The erosion hazard is slight.

Included with this soil in mapping are small areas of Bleiblerville, Latium, Brenham, Carbengle, Klump, and Knolle soils. Included soils make up less than 20 percent of any mapped area.

This soil is used for pasture, range, and crops.

This soil is well suited to pasture. Improved bermudagrass and kleingrass are suited to this soil.

This soil is well suited to corn, grain sorghum, cotton, small grains, and forage sorghums. Leaving crop residue on the surface helps to control erosion, maintain organic matter content, and maintain tilth. Terraces and contour farming also help to control erosion.

If used for range, this soil can produce large yields of tall and mid native grasses. Management should include stocking at proper rates, brush control, and planned grazing.

This soil is poorly suited to recreational and urban uses. The main limitations are shrink-swell properties, very slow permeability, and low strength, which affects roads and streets.

This soil is in capability subclass IIe and Blackland (Blackland Prairie) range site.

FrC—Frelsburg clay, 3 to 5 percent slopes. This deep, gently sloping soil is on upland side slopes. Areas range from 5 to 100 acres in size. Slope is mostly about 4 percent.

Typically, the surface layer is about 4 inches of very dark gray clay over 11 inches of dark gray clay. The next 40 inches is dark grayish brown clay with yellowish brown mottles. Below this to a depth of 65 inches is light brownish gray clay with brownish yellow mottles. Reaction is moderately alkaline and calcareous throughout.

This soil is well drained. Surface runoff is medium. Permeability is very slow. Available water capacity is high. Water enters rapidly when the soil is dry and cracked but very slowly when the soil is wet. The erosion hazard is moderate.

Included with this soil in mapping are small areas of Bleiblerville, Latium, Brenham, Carbengle, Knolle, and Klump soils. Included soils make up less than 20 percent of any mapped area.

This soil is used for pasture, range, and crops.

This soil is well suited to pasture. Improved bermudagrass and kleingrass are suited to this soil.

This soil is suited to corn, grain sorghum, cotton, small grains, and forage sorghum. Leaving crop residue on the surface helps to control erosion, maintain organic matter content, and maintain soil tilth. Terraces and contour farming also help to control erosion.

If used for range, this soil can produce large yields of tall and mid native grasses. Management should include stocking at proper rates, brush control, and planned grazing.

This soil is poorly suited to urban and recreational uses. The main limitations are shrink-swell properties, slow permeability, and low strength, which affects roads and streets. In some places, slope limits recreation use.

This soil is in capability subclass IIIe and Blackland (Blackland Prairie) range site.

FrD—Frelsburg clay, 5 to 8 percent slopes. This deep, sloping soil is on uplands. Areas range from 10 to 100 acres in size. Slope averages about 7 percent.

Typically, the surface layer is about 15 inches of dark gray clay. The next 30 inches is grayish brown and dark yellowish brown clay. Below this to a depth of 60 inches is light olive brown clay. The soil is moderately alkaline and calcareous throughout.

This soil is well drained. Surface runoff is rapid. Permeability is very slow. Available water capacity is high. Water enters rapidly when the soil is dry and cracked but very slowly when it is wet. The erosion hazard is severe.

Included with this soil in mapping are small areas of Bleiblerville, Latium, Brenham, Carbengle, Klump, and Knolle soils. Also included are small areas of strongly sloping Frelsburg soils. Included soils make up less than 20 percent of any mapped area.

This soil is used for range and pasture.

This soil is moderately well suited to pasture. Improved bermudagrass and kleingrass are the main grasses.

This soil is moderately well suited to small grains and forage sorghum. Leaving crop residue on the surface helps to maintain tilth and organic matter content and control erosion. Terraces also help to control erosion.

If used for range, this soil can produce large yields of tall and mid native grasses. Management should include stocking at proper rates, brush control, and planned grazing.

This soil is poorly suited to urban and recreational uses. The main limitations are shrink-swell properties, very slow permeability, low strength, which affects roads and streets, and slope.

This soil is in capability subclass IVe and Blackland (Blackland Prairie) range site.

HoB—Hockley fine sandy loam, 1 to 3 percent slopes. This deep, gently sloping soil is on uplands.

Areas range from 20 acres to several hundred acres in size. Slope averages 2 percent.

Typically, the surface layer is brown fine sandy loam about 7 inches thick. The subsurface layer is 15 inches of grayish brown fine sandy loam. The subsoil is sandy clay loam that is yellowish brown in the upper part, light yellowish brown in the middle part, and light gray in the lower part to a depth of 61 inches. Reddish, yellowish, and brownish mottles occur throughout the subsoil. The subsoil contains about 10 percent plinthite. Reaction is strongly acid in the surface layer and grades to medium acid in the lower part of the subsoil.

This soil is moderately well drained. A perched water table is between depths of 3.5 and 5.0 feet during winter. Surface runoff is slow. Permeability is moderately slow. Available water capacity is medium. The erosion hazard is moderate.

Included with this soil in mapping are areas of Wockley, Kenney, Monaville, Katy, and Segno soils. Included soils make up less than 15 percent of any mapped area.

This soil is used for crops, pasture, and range. A few areas are in woodland.

This soil is well suited to pasture. Improved bermudagrass and bahiagrass are suited to this soil.

This soil is well suited to corn, peanuts, soybeans, and truck crops. Leaving crop residue on the surface helps to maintain organic matter content and tilth and control erosion. Minimum tillage also helps to control erosion.

If used for range, this soil can produce large yields of tall native grasses. Management should include stocking at proper rates and planned grazing.

This soil is moderately well suited to urban and recreational uses. The main limitations are moderately low strength, which affects roads and streets, and seasonal wetness.

This soil is in capability subclass IIe and Loamy Prairie range site.

HoC—Hockley fine sandy loam, 3 to 5 percent slopes. This deep, gently sloping soil is on uplands. Areas range from 20 to 100 acres in size. Slope averages 4 percent.

Typically, the surface layer is about 15 inches of dark brown, strongly acid fine sandy loam. The subsurface layer is 8 inches of dark yellowish brown, medium acid fine sandy loam. The upper 13 inches of the subsoil is yellowish brown, very strongly acid sandy clay loam with red mottles; the next 9 inches is mottled light yellowish brown, brownish yellow, and dark red, very strongly acid sandy clay loam; and the lower part, to a depth of 62 inches, is light gray, very strongly acid sandy clay loam that has yellowish brown mottles and is about 10 percent plinthite.

This soil is moderately well drained. Surface runoff is medium. A perched water table is between depths of 3.5 and 5.0 feet during winter. Permeability is moderately slow. Available water capacity is medium. The erosion hazard is moderate.

Included with this soil in mapping are areas of Kenney, Monaville, and Segno soils. Also included are areas of Hockley gravelly sandy loam and small areas of Hockley soils having slopes less than 3 percent. Included soils make up less than 15 percent of any mapped area.

This soil is used for pasture, crops, and range. A few areas are in woodland.

This soil is well suited to pasture. Improved grasses such as coastal bermudagrass, weeping lovegrass, and bahiagrass are suited to this soil.

This soil is moderately well suited to corn, peanuts, small grains, and forage sorghum. Leaving crop residue on the surface helps to conserve moisture and maintain organic matter content and tilth. Minimum tillage helps to control erosion.

If used for range, this soil can produce high yields of tall native grasses. Management should include stocking at proper rates and planned grazing.

This soil is moderately well suited to urban and recreational uses. The main limitations are moderate seasonal wetness and low strength.

This soil is in capability subclass IIIe and Loamy Prairie range site.

HpC—Hockley gravelly fine sandy loam, 1 to 5 percent slopes. This deep, gently sloping soil is on uplands. Areas range from 10 to 100 acres in size. Slope averages 3 percent.

Typically, the surface layer is about 12 inches of dark grayish brown, medium acid, gravelly fine sandy loam. The subsurface layer is 12 inches of dark grayish brown, medium acid, very gravelly sandy loam. The upper 12 inches of the subsoil is yellowish brown, strongly acid gravelly sandy clay loam that has red mottles; the next 9 inches is light yellowish brown, strongly acid clay that has strong brown and red mottles; and the lower part, to a depth of 72 inches, is mottled light yellowish brown, strong brown, and red, strongly acid clay that is about 10 percent plinthite.

This soil is moderately well drained. A perched water table is between depths of 3.5 and 5.0 feet during winter. Surface runoff is slow to medium. Permeability is moderately slow. Available water capacity is medium. The erosion hazard is moderate.

Included with this soil in mapping are areas of Monaville and Segno soils and other Hockley soils that are not gravelly. Also included are areas of Hockley soils from which the surface layer has been removed for use as roadbase. Included soils make up less than 15 percent of any mapped area.

The soil is used for pasture and range. A few areas are in woodland, and some areas are in corn and peanuts.

This soil is well suited to pasture. Improved bermudagrass and bahiagrass are suited to this soil.

This soil is moderately well suited to corn, peanuts, small grains, and forage sorghum. The gravelly surface layer hinders tillage. Leaving crop residue on the surface helps to maintain organic matter content and control erosion. Minimum tillage also helps to control erosion.

If used for range this soil can produce large yields of native grasses. Management should include stocking at proper rates and planned grazing.

This soil is moderately well suited to urban and recreational uses. The main limitations are moderately low strength, which affects streets and roads, and seasonal wetness. In some places, slope limits some recreational uses.

This soil is in capability subclass IIIe and Loamy Prairie range site.

HzC—Hockley soils, graded, 1 to 5 percent slopes. These deep, gently sloping soils are on uplands. Areas range from 5 to 50 acres in size. Slope averages 3 percent. These areas have been mined for road construction material. In the process, the surface layer was stockpiled, the gravelly subsurface layer removed for use as roadbase, and the surface layer spread back over the area, mostly on the subsoil.

Typically, the surface layer is about 6 inches of very dark grayish brown, strongly acid gravelly fine sandy loam. The upper part of the subsoil is 18 inches of brownish yellow, strongly acid sandy clay loam that has red mottles; the next 31 inches is brownish yellow, strongly acid sandy clay loam that has brown and red mottles; and the lower part, to a depth of 65 inches, is red, strongly acid sandy clay loam that has yellow mottles. The surface layer is fine sandy loam, loam, or sandy clay loam and is gravelly in places.

These soils are moderately well drained. A perched water table is between depths of 3.5 and 5.0 feet during winter. Surface runoff is medium. Permeability is moderately slow. Available water capacity is medium. This soil is hard to till when dry because of hardening of the exposed subsoil. Fertility is very low because of the loss of organic matter through removal of the surface layer.

Included with these soils in mapping are areas of Wockley, Monaville, and Segno soils. Also included are areas of Hockley fine sandy loam and Hockley sandy clay loam. Included soils make up less than 15 percent of any mapped area.

These soils are used for range and pasture.

These soils are moderately well suited to pasture. improved bermudagrass and bahiagrass will grow but are difficult to establish.

These soils are poorly suited to crops. Most of the surface layer has been removed.

Production of native grasses depends primarily on the length of time the soil has been in grass and on the organic matter content. After grading, forage yields are initially low.

These soils are poorly suited to urban and recreational uses. The main limitations are the thin surface, which affects lawns and landscaping, moderately slow permeability, and seasonal wetness. In some places, slope limits recreational uses.

These soils are in capability subclass IIIe.

KaA—Katy fine sandy loam, 0 to 1 percent slopes. This deep, nearly level soil is on broad uplands. Areas range from 20 acres to several thousand acres in size. Slope averages 0.5 percent.

Typically, the surface layer is about 10 inches of grayish brown fine sandy loam. The subsurface layer is 12 inches of pale brown fine sandy loam. The upper 7 inches of the subsoil is grayish brown sandy clay loam with brownish mottles, and the lower part, to a depth of 80 inches, is clay that is gray over light gray and has reddish and brownish mottles throughout. Reaction is medium acid in the upper part and neutral in the lower part.

This soil is somewhat poory drained. A perched water table is between the surface and a depth of 2.5 feet during winter. Surface runoff is very slow. Permeability is moderately slow. Available water capacity is medium. This soil is sometimes difficult to work because of seasonal wetness. The erosion hazard is slight.

Included with this soil in mapping are small areas of Aris, Wockley, Waller, and Edna soils. Included soils make up less than 15 percent of any mapped area.

This soil is used for crops, pasture, and range. Rice is the main crop but soybeans, peanuts, and corn are also grown.

This soil is well suited to pasture. Improved bermudagrass and bahiagrass are suited to this soil.

This soil is well suited to rice and soybeans and moderately well suited to corn and peanuts. Leaving crop residue on the surface helps to maintain organic matter content and tilth. Rotating crops improves yields.

If used for range, this soil can produce large yields of native grasses. Management should include stocking at proper rates and planned grazing.

This soil is poorly suited to urban and recreational uses. The main limitations are wetness and moderately slow permeability. Low strength limits use for roads and streets.

This soil is in capability subclass IIIw and Loamy Prairie range site.

KaB—Katy fine sandy loam, 1 to 3 percent slopes. This deep, gently sloping soil is on upland breaks. Areas range from 10 to 200 acres in size. Slope averages about 2 percent.

Typically, the surface layer is about 8 inches of medium acid, brown fine sandy loam. The subsurface layer is 17 inches of pale brown fine sandy loam. The upper 20 inches of the subsoil is grayish brown, medium acid sandy clay loam with red and brown mottles; the next 18 inches is mottled red and gray, neutral clay; and the lower part is red, neutral clay to a depth of 72 inches.

This soil is somewhat poorly drained. A perched water table is between the surface and a depth of 2.5 feet during winter. Surface runoff is medium. Permeability is moderately slow. Available water capacity is medium. The erosion hazard is moderate.

Included with this soil in mapping are small areas of Aris, Edna, Waller, and Wockley soils. Also included along breaks are areas of a soil that is similar to Katy soils but that has a surface layer less than 20 inches thick. Included soils make up less than 15 percent of any mapped area.

This soil is used for crops, range, and pasture. Rice, soybeans, and forage sorghum are the main crops.

The soil is well suited to pasture. Coastal bermudagrass and bahiagrass are suited to this soil.

This soil is moderately well suited to rice, corn, soybeans, and forage sorghum. Leaving crop residue on the surface helps to maintain organic matter content and tilth and control erosion. Minimum tillage also helps to control erosion.

If used for range, this soil produces large yields of native grasses. Management should include stocking at proper rates and planned grazing.

This soil is poorly suited to urban and recreational uses because of wetness and moderately slow permeability. Low strength limits use for roads and streets.

This soil is in capability subclass IIIe and Loamy Prairie range site.

KcB—Katy-Edna complex, 0 to 3 percent slopes. These deep, nearly level, slightly moundy soils are on broad, flat uplands. The areas are irregularly shaped and range from 30 to 500 acres in size. The Katy soil makes up 40 percent of this complex, the Edna soil makes up 30 percent, and other soils make up 30 percent. Katy soils are on the mounds and Edna soils are in the depressions. The areas of these soils are so intricately mixed that separating them is not practical at the scale of mapping.

The Katy soil typically has a surface layer of grayish brown, medium acid fine sandy loam about 8 inches thick. The subsurface layer is 17 inches of medium acid, pale brown fine sandy loam. The upper part of the subsoil is 7 inches of grayish brown, medium acid sandy clay loam that has dark yellowish brown mottles; the next 21 inches is gray, medium acid clay that has yellowish brown and dark red mottles; and the lower part, to a depth of 65 inches, is gray, neutral clay that has yellowish red mottles.

The Katy soil is somewhat poorly drained. Runoff is slow. A perched water table is between the surface and a depth of 2.5 feet during winter. Permeability is very slow. Available water capacity is medium. The erosion hazard is slight.

The Edna soil typically has a surface layer of light brownish gray, medium acid fine sandy loam about 8 inches thick. The upper part of the subsoil is 17 inches of dark gray, medium acid clay; the next 14 inches is dark gray, neutral clay that has brownish and grayish mottles; and the lower part is light brownish gray and light yellowish brown, moderately alkaline clay to a depth of 65 inches.

The Edna soil is poorly drained. A perched water table is between the surface and a depth of 1.5 feet during winter. Surface runoff is very slow. Permeability is very slow. Available water capacity is medium. The erosion hazard is slight.

Included in this complex in mapping are small areas of Aris, Waller, and Wockley soils. These soils make up less than 15 percent of any mapped area.

This complex is used mainly for range. A few areas are in pasture or crops.

These soils are moderately well suited to pasture. Improved bermudagrass and bahiagrass are suited to these soils.

These soils are well suited to rice if extensive leveling is done. They are moderately well suited to soybeans.

If used for range, these soils can produce large yields of native grasses. Management should include stocking at proper rates and planned grazing.

These soils are poorly suited to urban and recreational uses because of the wetness and very slow permeability. Low strength limits use for roads and streets.

This complex is in capability subclass IIIw. The Katy part is in Loamy Prairie range site, and the Edna part is in Claypan Prairie range site.

KeD—Kenney loamy fine sand, 1 to 8 percent slopes. This deep, gently sloping to sloping soil is on convex uplands. Areas are irregularly shaped and range from 20 to 250 acres in size. Slope averages 3 percent.

Typically, the surface layer is about 8 inches of brown loamy fine sand. The subsurface layer is 54 inches of loamy fine sand that is pale brown in the upper part and very pale brown in the lower part. The subsoil is red sandy clay loam to a depth of 80 inches. Reaction is very strongly acid in the upper part and strongly acid in the lower part.

This soil is well drained. Surface runoff is very slow. Permeability is rapid in the surface layer and moderately rapid in the subsoil. Available water capacity is low. The water erosion hazard is slight and the wind erosion hazard is severe.

Included with this soil in mapping are small areas of Monaville, Hockley, Styx, and Wockley soils. Also included are areas of a soil that is similar to Kenney soils but in which the subsoil is mostly bands of sandy clay loam interlayered with sandy material. Included soils make up less than 15 percent of any mapped area.

This soil is used for pasture, crops, and range.

This soil is well suited to pasture. Improved bermudagrass, bahiagrass, and lovegrass are suited to this soil.

Watermelons, peanuts, corn, small grains, and truck crops are well suited to this soil. Leaving crop residue on the surface helps to control erosion and maintain organic matter content. Stripcropping and leaving the surface rough help to control wind erosion. Minimum tillage also helps to control erosion.

If used for range, this soil can produce large yields of tall native grasses. Management should include stocking at proper rates and planned grazing.

This soil is moderately well suited to urban and recreational uses. The main limitations are sandy texture and seepage. Cutbanks of excavations tend to cave in.

This soil is in capability subclass IIIe and Sandy Prairie range site.

KlC—Klump sandy loam, 3 to 5 percent slopes. This deep, gently sloping soil is on upland hilltops. Areas range from 10 to 100 acres in size. Slope averages about 4 percent.

Typically, the surface layer is dark brown, slightly acid sandy loam about 12 inches thick. The upper 4 inches of the subsoil is dark brown, medium acid sandy clay loam; the next 9 inches is mottled dark brown and dark red, medium acid sandy clay loam; and the lower 30 inches is red and yellowish red, strongly acid sandy clay loam. The underlying material is medium acid brownish yellow sandy loam to a depth of 70 inches.

This soil is well drained. Runoff is medium. Permeability is moderate. Available water capacity is medium. The erosion hazard is moderate.

Included with this soil in mapping are small areas of Knolle, Cuero, Brenham, Crockett, Carbengle, and Frelsburg soils. Also included are a few areas of Klump fine sandy loam and Klump loamy sand. Included soils make up less than 15 percent of any mapped area.

This soil is used for pasture, range, and crops. The main crops are small grains and forage sorghum.

This soil is well suited to pasture. Improved bermudagrass, bahiagrass, and lovegrass are suited to this soil.

Forage sorghum, oats, wheat, grain sorghum, corn, and other crops are well suited to this soil. Leaving crop residue on the surface, as in minimum tillage, helps to maintain tilth and organic matter content and control erosion. Terraces and contour farming help to control erosion and runoff.

If used for range, this soil can produce yields of tall and mid native grasses. Management should include stocking at proper rates and planned grazing.

This soil is well suited to urban and recreational uses. In places, slope limits some recreational uses.

This soil is in capability subclass IIIe and Sandy Loam range site.

KlD—Klump sandy loam, 5 to 8 percent slopes. This deep, sloping soil is on uplands. Areas are irregular in shape and range from 10 to 50 acres in size. Slope averages about 7 percent.

Typically, the surface layer is 10 inches of very dark grayish brown, mildly alkaline sandy loam. The upper 5 inches of the subsoil is very dark brown, neutral sandy clay loam, and the lower part, to a depth of 65 inches, is yellowish red, slightly acid sandy clay loam with many, medium, distinct, brown mottles.

This soil is well drained. Surface runoff is medium. Permeability is moderate. Available water capacity is medium. The erosion hazard is moderate.

Included with this soil in mapping are small areas of Knolle, Cuero, Brenham, Carbengle, Crockett, and Frelsburg soils. Included soils make up less than 20 percent of any mapped area.

This soil is used for range, pasture, and crops. The main crops are oats, wheat, and forage sorghum.

This soil is well suited to pasture. Improved bermudagrass, bahiagrass, and lovegrass are suited to this soil.

This soil is fairly suited to corn, grain sorghum, oats, wheat, and forage sorghum. Leaving crop residue on the surface, as in minimum tillage, helps to maintain organic matter content and tilth and control erosion.

If used for range, this soil can produce large yields of tall and mid native grasses. Management should include stocking at proper rates and planned grazing.

This soil is moderately well suited to urban and recreational uses. Slope is the main limitation.

This soil is in capability subclass IVe and Sandy Loam range site.

KnC—Knolle loamy sand, 1 to 5 percent slopes. This deep, gently sloping soil is on uplands. Areas are irregular and range from 10 to 100 acres in size. Slope averages about 4 percent.

Typically, the surface layer is about 8 inches of brown, medium acid loamy sand over 10 inches of dark grayish brown, medium acid loamy sand. The upper 12 inches of the subsoil is dark brown, strongly acid sandy clay loam with strong brown mottles; the next 15 inches is strong brown, strongly acid sandy clay loam with red mottles; and the lower 9 inches is yellowish red, strongly acid sandy clay loam. The underlying material is strong

brown, medium acid sandy clay loam to a depth of 70 inches.

This soil is well drained. Runoff is slow. Permeability is moderate. Available water capacity is medium. The water and wind erosion hazards are moderate.

Included with this soil in mapping are small areas of Brenham, Carbengle, Klump, Frelsburg, Latium, and Crockett soils. Included also are areas of Klump loamy sand and sloping Klump soils. Included soils make up less than 15 percent of any mapped area.

This soil is used for pasture, crops, and range. The main crops are small grains and forage sorghum.

This soil is well suited to pasture. Improved bermudagrass, weeping lovegrass, and bahiagrass are suited to this soil.

Corn, cotton, peanuts, small grains, forage sorghum, and grain sorghum do well on this soil. Leaving crop residue on the surface, as in minimum tillage, helps to control erosion and maintain organic matter content.

If used for range, this soil can produce large yields of mid and tall native grasses. Management should include stocking at proper rates and planned grazing.

This soil is moderately well suited to urban and recreational uses. The main limitation is sandy texture. In some places, slope limits recreational uses.

This soil is in capability subclass IIIs and Sandy Loam range site.

KuC—Kuy loamy fine sand, 1 to 5 percent slopes. This deep, gently sloping soil is in hummocky areas on uplands. Areas are rounded or elongated and range from 10 to 50 acres in size. Slope averages about 3 percent.

Typically, the surface layer is about 15 inches of brown, medium acid loamy fine sand. The subsurface layer is 37 inches of pink, medium acid loamy fine sand. The upper 12 inches of the subsoil is light gray, strongly acid fine sandy loam with yellowish red and yellowish brown mottles, and the lower part is mottled light gray, reddish brown, and yellowish brown, strongly acid sandy clay loam to a depth of 72 inches.

This soil is moderately well drained. A high water table is between depths of 3.0 and 5.0 during the winter and spring. Surface runoff is very slow. Permeability is rapid in the surface layer and moderately slow in the subsoil. Available water capacity is medium. The water erosion hazard is moderate, and the wind erosion hazard is severe.

Included with this soil in mapping are small areas of Aris, Hockley, Katy, Monaville, and Wockley soils. Aris, Katy, and Wockley soils are in depressed areas and on footslopes, and Hockley and Monaville soils are along slope breaks. Included soils make up less than 15 percent of any mapped area.

This soil is used for pasture, range, and crops. The main crops are peanuts, corn, and forage sorghum.

This soil is well suited to pasture. Improved bermudagrass, weeping lovegrass, and bahiagrass are suited to this soil.

This soil is moderately well suited to corn, peanuts, and forage sorghum. Leaving crop residue on the surface, as in minimum tillage, helps to control erosion, conserve moisture, and maintain organic matter content.

If used for range, this soil can produce moderate yields of native grasses. Management should include stocking at proper rates and planned grazing.

This soil is moderately well suited to urban and recreational uses. The main limitations are sandy texture and wetness. Cutbanks of excavations tend to cave in.

This soil is in capability subclass IIIs and Deep Sand range site.

KyB—Kuy-Aris complex, 0 to 3 percent slopes. These deep, gently undulating, moundy soils are along poorly defined drainageways and on broad flats on uplands. Areas are elongated to irregularly shaped and range from 30 to 500 acres in size. Slope averages about 2 percent. Kuy loamy fine sand and similar soils make up about 50 percent of this complex, the Aris soil makes up about 40 percent, and other soils make up about 10 percent. Kuy and similar soils are on sandy mounds. The Aris soil is in lower areas between the mounds and receives additional water. The areas of these soils are so intricately mixed that separating them is not practical at the scale of mapping.

Typically, the Kuy soil is brown, medium acid loamy fine sand to a depth of about 50 inches. The subsoil, to a depth of 70 inches, is light brownish gray, medium acid sandy clay loam with reddish and brownish mottles.

The Kuy soil is moderately well drained. A water table is between depths of 3.0 and 5.0 feet during winter and spring. Surface runoff is slow. Permeability is moderate. Available water capacity is medium. The water erosion hazard is moderate, and the wind erosion hazard is severe.

Typically, the Aris soil is grayish brown, slightly acid fine sandy loam to a depth of about 22 inches. The upper 13 inches of the subsoil is mottled gray and yellowish brown, slightly acid sandy clay loam with tongues of fine sandy loam. The lower part of the subsoil, to a depth of 60 inches, is gray, slightly acid clay with reddish brown and red mottles.

The Aris soil is somewhat poorly drained. A perched water table is between depths of 0.5 and 2.0 feet during winter. Runoff is slow. Permeability is very slow. Available water capacity is medium. The erosion hazard is slight.

Included with these soils in mapping are small areas of Edna, Katy, Monaville, Waller, and Wockley soils. Included soils make up less than 10 percent of any mapped area.

These soils are used for range and pasture.

These soils are moderately well suited to pasture. Improved bermudagrass, bahiagrass, and weeping lovegrass are suited to these soils.

These soils are moderately well suited to crops, but most areas need extensive leveling to be productive.

If used for range, these soils can produce moderate yields of tall native grasses. Management should include stocking at proper rates and planned grazing.

These soils are poorly suited to urban and recreational uses. The sandy surface layer and wetness are the main limitations.

This complex is in capability subclass IIIw. The Kuy part is in Deep Sand range site, and the Aris part is in Loamy Prairie range site.

LaA—Lake Charles clay, 0 to 1 percent slopes. This deep, nearly level soil is on broad, nearly level uplands. Areas are irregular in shape and range from 20 acres to several thousand acres in size. Slope averages 0.5 percent.

Typically, the surface layer is black clay about 9 inches thick. The next 36 inches is very dark gray clay, and the next 17 inches is dark gray clay. The underlying material is grayish brown clay. Reaction is mildly alkaline in the surface layer and moderately alkaline in the lower part.

This soil is somewhat poorly drained. A high water table is between the surface and a depth of 2.0 feet for long periods during winter and early spring. Available water capacity is high. When dry, this soil has deep cracks that extend from the surface to the underlying material. Water enters rapidly when the soil is dry and cracked but very slowly when it is wet and the cracks are sealed. Permeability is very slow. Surface runoff is very slow. The erosion hazard is slight.

Included with this soil in mapping are small areas of Midland and Edna soils. Included soils make up less than 15 percent of any mapped area.

This soil is used for crops, pasture, and range. The main crops are grain sorghum, corn, and cotton.

This soil is well suited to pasture. Improved bermudagrass, bahiagrass, and kleingrass are suited to this soil.

Cotton, grain sorghum, soybeans, corn, and forage sorghum are well suited to this soil. Leaving crop residue on the surface helps to maintain tilth and organic matter content.

If used for range, this soil can produce large yields of tall and mid native grasses. Management should include stocking at proper rates and planned grazing.

This soil is poorly suited to urban and recreational uses. Shrink-swell properties, wetness, very slow permeability, and low strength, which affects roads and streets, are the main limitations.

This soil is in capability subclass IIw and Blackland (Coast Prairie) range site.

LaB—Lake Charles clay, 1 to 3 percent slopes. This deep, gently sloping soil is on broad uplands. Areas are irregular in shape and range from 10 to 100 acres in size. Slope averages 2 percent.

Typically, the surface layer is 25 inches of black, moderately alkaline clay. The next 10 inches is dark grayish brown, moderately alkaline clay with black streaks. Below this to a depth of 60 inches is reddish brown, moderately alkaline clay.

This soil is somewhat poorly drained. A high water table is between the surface and a depth of 2.0 feet for long periods during winter and early spring. Surface runoff is medium. Permeability is very slow. Available water capacity is high. When dry, this soil has deep cracks that extend from the surface to the underlying material. Water enters rapidly when the soil is dry and cracked but very slowly when it is wet. The erosion hazard is slight.

Included with this soil in mapping are small areas of Midland and Edna soils. Included soils make up less than 15 percent of any mapped area.

This soil is used for crops, range, and pasture. The main crops are cotton, grain sorghum, corn, and forage sorghum.

This soil is well suited to pasture. Improved bermudagrass, bahiagrass, and kleingrass are suited to this soil.

This soil is well suited to corn, soybeans, cotton, grain sorghum, and forage sorghum. Terraces and contour farming help to control runoff and erosion. Leaving crop residue on the surface, as in minimum tillage, helps to maintain organic matter content, control erosion, and maintain tilth.

If used for range, this soil can produce large yields of mid and tall native grasses. Management should include stocking at proper rates and planned grazing.

This soil is poorly suited to urban and recreational uses. The main limitations are shrink-swell properties, wetness, very slow permeability, and low strength, which affects roads and streets.

This soil is in capability subclass IIe and Blackland (Coast Prairie) range site.

LaD—Lake Charles clay, 3 to 8 percent slopes. This deep, gently sloping to sloping soil is on uplands. Areas are elongated and lie along narrow breaks between landforms with different elevations. The areas range from 5 to 100 acres in size. Slope averages about 7 percent.

Typically, the surface layer is very dark gray, moderately alkaline clay about 12 inches thick. The next 28 inches is dark grayish brown, moderately alkaline clay with streaks of very dark gray. Below this to a depth of 65 inches is reddish brown, moderately alkaline clay.

This soil is somewhat poorly drained. Surface runoff is rapid. Water enters rapidly when the soil is cracked and dry but very slowly when the soil is wet and cracks are closed. Permeability is very slow. Available water capacity is high. The water erosion hazard is severe.

Included with this soil in mapping are small areas of Edna, Midland, and Silawa soils. Also included are small areas of a soil that is similar to Lake Charles soils but that has a lighter colored surface layer. Included soils make up less than 15 percent of a mapped area.

This soil is used for range, pasture, and crops. The main crops are forage sorghum and small grains.

This soil is moderately well suited to pasture. Improved bermudagrass and kleingrass are suited to this soil.

This soil is moderately well suited to grain sorghum, forage sorghum, and small grains. Terraces help to control runoff and erosion. Leaving crop residue on the surface, as in minimum tillage, helps to control erosion and maintain organic matter content.

If used for range, this soil can produce large yields of tall and mid native grasses. Management should include stocking at proper rates and planned grazing.

This soil is poorly suited to urban and recreational uses. The main limitations are shrink-swell properties and slope.

This soil is in capability subclass IVe and Blackland (Coast Prairie) range site.

LdC—Landman loamy fine sand, 1 to 5 percent slopes. This deep, gently sloping soil is on uplands and foot slopes. Areas are elongated in shape and range from 30 to 200 acres in size. Slope ranges from 1 to 5 percent.

Typically, the surface layer is grayish brown loamy fine sand about 6 inches thick. The subsurface layer is 59 inches of light brown loamy fine sand. The upper 5 inches of the subsoil is reddish yellow sandy clay loam with very pale brown mottles, and the lower part, to a depth of 80 inches, is strong brown sandy clay loam with light brownish gray and reddish brown mottles. Reaction is medium acid in the surface layer and strongly acid in the subsoil.

This soil is moderately well drained. A perched water table is between depths of 4.0 and 6.0 feet during winter and spring. Surface runoff is very slow. Available water capacity is low. Permeability is rapid in the surface layer and moderately slow in the sandy clay loam subsoil. The water erosion hazard is slight, and the wind erosion hazard is severe.

Included with this soil in mapping are small areas of Boy, Conroe, Fetzer, Depcor, and Larue soils. Included soils make up less than 15 percent of any mapped area.

This soil is used for woodland and pasture.

This soil is well suited to pasture. Improved bermudagrass, weeping lovegrass, and bahiagrass are suited to this soil.

Corn, peanuts, watermelons, and truck crops are well suited to this soil. Minimum tillage helps to control water and wind erosion.

If used for grazing, this soil can produce moderate yields of tall native grasses. However, most areas presently have a dense canopy of pine and hardwoods; therefore, grass production is low. Proper management includes thinning trees, stocking at proper rates, and planned grazing.

This soil is moderately well suited to urban and recreational uses. Sandy texture, seasonal wetness, and seepage are the main limitations. Cutbanks of excavations tend to cave in.

This soil is in capability subclass IIIs.

LlE—Landman-Larue complex, 3 to 12 percent slopes. These deep, gently sloping to strongly sloping soils are on convex ridges and side slopes on uplands. Areas are irregular in shape and range from 30 to 700 acres in size. Slope averages about 5 percent. The Landman soil makes up about 40 percent of the complex, the Larue soil makes up about 30 percent, and other soils make up 30 percent. The areas of these soils are so intricately mixed that separating them was not feasible at the scale of mapping.

Typically, the Landman soil is about 63 inches of loamy fine sand that is brown in the upper part and light yellowish brown in the lower part. The subsoil, to a depth of 80 inches, is reddish yellow sandy clay loam with yellowish red and light brownish gray mottles. Reaction is medium acid in the surface layer and strongly acid in the subsoil.

The Landman soil is moderately well drained. Surface runoff is very slow. Permeability is moderately slow. Available water capacity is low. The water erosion hazard is moderate, and the wind erosion hazard is severe.

Typically, the Larue soil has a surface layer of loamy fine sand that is about 28 inches thick and that is brown in the upper part and light brown in the lower part. The subsoil is yellowish red sandy clay loam to a depth of 72 inches. Reaction is slightly acid to medium acid in the upper part and medium acid in the subsoil.

The Larue soil is well drained. Surface runoff is slow. Permeability is moderate. Available water capacity is medium. The water erosion hazard is moderate, and the wind erosion hazard is severe.

Included with these soils in mapping are small areas of Depcor, Conroe, Boy, and Fetzer soils. Also included are areas of a soil that is similar to Larue soils but that has a yellowish brown subsoil. Included soils make up about 30 percent of any mapped area.

These soils are used mainly for woodland. Some areas are in pasture or urban uses.

These soils are well suited to pasture. Improved bermudagrass, bahiagrass, and weeping lovegrass are suited to these soils.

Corn, peanuts, watermelons, and truck crops are moderately well suited to the soils. Leaving crop residue on the surface through minimum tillage helps to maintain organic matter content and control erosion.

If used for grazing, these soils can produce moderate yields of tall native grasses. Most areas have a dense stand of pine and hardwoods and grass production is low. Management should include tree thinning, stocking at proper rates, and planned grazing.

These soils are moderately well suited to urban and recreational uses. The main limitations are sandy texture, slope, and seepage. Seasonal wetness is a limitation in some places.

This complex is in capability subclass IVe.

LtC—Latium clay, 2 to 5 percent slopes. This deep, gently sloping soil is along slope breaks on uplands. Areas are elongated and follow the contour of the landform. The areas range from 5 to 50 acres in size. Slope is mostly 4 to 5 percent.

Typically, the surface layer is about 8 inches of very dark gray, moderately alkaline clay. The 12 inches is light olive brown, moderately alkaline clay with black streaks. Below this to a depth of 60 inches is light olive brown and grayish brown, moderately alkaline clay.

This soil is well drained. Surface runoff is medium. Permeability is very slow. Available water capacity is high. Erosion has removed some of the surface layer in places. The erosion hazard is severe.

Included with this soil in mapping are small areas of Bleiblerville, Brenham, Carbengle, Frelsburg, and Klump soils. Also included are a few gullies about 6 feet deep along field boundaries and drainageways. Included soils make up less than 20 percent of any mapped area.

This soil is used for pasture, range, and crops. Forage sorghum, grain sorghum, and small grains are the main crops.

This soil is moderately well suited to pasture. Improved bermudagrass and kleingrass are suited to this soil.

Corn, cotton, forage sorghum, grain sorghum, and small grains are moderately well suited to this soil. Leaving crop residue on the surface, as in minimum tillage, helps to maintain organic matter content and control erosion. Terraces, grassed waterways, and contour farming also help to control runoff and erosion.

If used for range, this soil can produce moderate yields of tall and mid native grasses. Management should include stocking at proper rates and planned grazing.

This soil is poorly suited to urban and recreational uses. The main limitations are shrink-swell properties, very slow permeability, and low strength, which affects road and streets.

This soil is in capability subclass IIIe and Eroded Blackland range site.

LtE—Latium clay, 5 to 12 percent slopes. This deep, sloping to strongly sloping soil is on uplands. Areas are linear and follow the contour of the landform. The areas range from 5 to 100 acres in size. Slope averages about 10 percent.

Typically, the surface layer is about 4 inches of olive gray, moderately alkaline clay. Below this to a depth of 60 inches is olive, moderately alkaline clay.

This soil is well drained. Surface runoff is rapid. Available water capacity is high. The water erosion hazard is severe.

Included with this soil in mapping are small areas of Frelsburg, Brenham, Klump, Knolle, Renish, and Carbengle soils. Also included are a few gullies about 8 feet deep along drainageways and a few areas of gently sloping Latium soils. Included soils make up less than 15 percent of any mapped area.

This soil is used for range and pasture.

This soil is moderately well suited to pasture. Improved bermudagrass and kleingrass are suited to this soil.

This soil is not suited to crops because of slope and the erosion hazard.

If used for range, this soil can produce moderate yields of mid and tall native grasses. Management should include stocking at proper rates, brush control, and planned grazing.

This soil is poorly suited to urban and recreational uses. The main limitations are shrink-swell properties, very slow permeability, slope, and low strength, which affects roads and streets.

This soil is in capability subclass VIe and Eroded Blackland range site.

LuA—Lufkin fine sandy loam, 0 to 1 percent slopes. This deep, nearly level soil is in depressions on uplands. Areas are irregularly shaped and range from 5 to 100 acres in size. Slope averages 0.5 percent.

Typically, the surface layer is 5 inches of grayish brown, slightly acid fine sandy loam with dark brown mottles. The upper 15 inches of the subsoil is dark gray, slightly acid clay with yellowish brown mottles, and the lower 25 inches is dark gray, moderately alkaline clay with brownish yellow mottles. The underlying material, to a depth of 62 inches, is yellowish brown, moderately alkaline clay loam with brown and yellow mottles.

This soil is somewhat poorly drained. A perched water table is between the surface and a depth of 1.0 foot during winter and spring. Surface runoff is slow. Permeability is very slow. Available water capacity is medium. The erosion hazard is slight.

Included with this soil in mapping are small areas of Axtell, Chazos, Straber, Tabor, Rader, and Tremona

soils. Included soils make up less than 20 percent of any mapped area.

This soil is used mainly for range and pasture.

This soil is moderately well suited to pasture. Improved bermudagrass and bahiagrass are suited to this soil.

Small grains and forage sorghum are fairly suited to this soil. This soil is difficult to till when dry because of the crusty surface. Leaving crop residue on the surface helps to maintain organic matter content and tilth. Surface drainage helps to remove excess water in wet seasons.

If used for range, this soil can produce moderate yields of mid and tall native grasses. Many areas have dense stands of hardwoods. Management should include brush control, stocking at proper rates, and planned grazing.

This soil is poorly suited to urban and recreational uses. The main limitations are wetness, shrink-swell properties, very slow permeability, and low strength, which affects roads and streets.

This soil is in capability subclass IIIw and Claypan Savannah range site.

LuB—Lufkin fine sandy loam, 1 to 3 percent slopes. This deep, gently sloping soil is along drainageways on uplands. Areas are irregular in shape and range from 10 to 100 acres in size. Slope averages 2 percent.

Typically, the surface layer is fine sandy loam about 9 inches thick that is dark grayish brown in the upper part and grayish brown in the lower part. The upper 13 inches of the subsoil is dark gray clay with common, medium, distinct, yellowish brown mottles; the next 30 inches is grayish brown clay with common, medium, distinct, brownish yellow mottles; and the lower part is grayish brown clay to a depth of 65 inches. Reaction is medium acid in the surface layer, strongly acid in the upper part of the subsoil, and neutral in the lower part.

This soil is somewhat poorly drained. A perched water table is between the surface and a depth of 1.0 foot during winter and spring. Surface runoff is medium. Permeability is very slow. Available water capacity is medium. The erosion hazard is moderate.

Included with this soil in mapping are small areas of Axtell, Chazos, Straber, Tabor, and Tremona soils. Included soils make up less than 15 percent of any mapped area.

This soil is used for range and pasture. Some areas are cropped to small grains and forage sorghum.

This soil is moderately well suited to pasture. Improved bermudagrass and bahiagrass are suited to this soil.

This soil is fairly suited to small grains and forage sorghum. Leaving crop residue on the surface, as in minimum tillage, helps to control erosion and maintain tilth and organic matter content.

If used for range, this soil can produce moderate yields of mid and tall native grasses. Management should include brush control, stocking at proper rates, and planned grazing.

This soil is poorly suited to urban and recreational uses. The main limitations are shrink-swell properties, very slow permeability, wetness, and low strength, which affects roads and streets.

This soil is in capability subclass IIIw and Claypan Savannah range site.

MaA—Mabank fine sandy loam, 0 to 1 percent slopes. This deep, nearly level soil is on broad flats on uplands. Areas are 20 to 300 acres in size. Slope averages 0.5 percent.

Typically, the surface layer is about 8 inches of slightly acid fine sandy loam that is dark grayish brown in the upper part and very dark gray in the lower part. The upper 29 inches of the subsoil is very dark gray, neutral clay; the next 8 inches is dark gray, neutral clay; the lower part, to a depth of 73 inches, is moderately alkaline clay that is grayish brown in the upper part and yellowish red in the lower part.

This soil is somewhat poorly drained. A perched water table is at a depth of 0.6 to 1.0 foot during winter and spring. Surface runoff is slow. Permeability is very slow. Available water capacity is medium. This soil is difficult to till during times of seasonal wetness. The erosion hazard is slight.

Included with this soil in mapping are small areas of Crockett, Wilson, Burleson, and Edna soils. Included soils make up less than 15 percent of any mapped area.

This soil is used for pasture, range, and crops. The main crops are corn, small grains, and forage sorghum.

This soil is moderately well suited to pasture. Improved bermudagrass and bahiagrass are suited to this soil.

This soil is fairly suited to corn, cotton, grain sorghum, small grains, and forage sorghum. Leaving crop residue on the surface helps to maintain organic matter content and tilth. Surface drainage helps to remove excess water during wet seasons.

If used for range, this soil can produce moderate yields of tall and mid native grasses. Management should include stocking at proper rates and planned grazing.

This soil is poorly suited to urban and recreational development. The main limitations are shrink-swell properties, wetness, very slow permeability, and low strength, which affects roads and streets.

This soil is in capability subclass IIIw and Claypan Prairie range site.

MaB—Mabank fine sandy loam, 1 to 3 percent slopes. This deep, gently sloping soil is on uplands. Areas are irregularly shaped and range from 5 to 80 acres in size. Slope averages 1.5 percent.

Typically, the surface layer is about 8 inches of grayish brown, slightly acid fine sandy loam. The upper 16 inches of the subsoil is very dark gray, neutral clay, the next 14 inches is very dark grayish brown, mildly alkaline clay, and the lower part is strong brown and light yellowish brown, moderately alkaline clay to a depth of 65 inches.

This soil is somewhat poorly drained. A perched water table is between depths of 0.6 and 1.0 foot during winter and spring. Surface runoff is medium. Permeability is very slow. Available water capacity is medium. Plant roots have difficulty penetrating the clayey subsoil. The erosion hazard is slight.

Included with this soil in mapping are small areas of Axtell, Burleson, Crockett, Tabor, and Wilson soils. Also included are small areas of Mabank soils having a loam or silt loam surface layer. Included soils make up less than 20 percent of any mapped area.

This soil is used for pasture, range, and crops. The main crops are forage sorghum and small grains.

This soil is moderately well suited to pasture. Improved bermudagrass and bahiagrass are suited to this soil.

This soil is moderately well suited to corn, cotton, grain sorghum, forage sorghum, and small grains. Terraces and contour tillage help to control erosion. Leaving crop residue on the surface, as in minimum tillage, helps to maintain organic matter content and tilth and control erosion.

If used for range, this soil can produce moderate yields of mid and tall native grasses. Management should include stocking at proper rates and planned grazing.

This soil is poorly suited to urban and recreational uses. The main problems are shrink-swell properties, seasonal wetness, very slow permeability, and low strength, which affects roads and streets.

This soil is in capability subclass IIIe and Claypan Prairie range site.

MdA—Midland clay loam, 0 to 1 percent slopes. This deep, nearly level soil is on broad upland flats. Areas are irregularly shaped and range from 20 acres to several hundred acres in size. Slope averages 0.5 percent.

Typically, the surface layer is about 6 inches of dark grayish brown clay loam. The upper 48 inches of the subsoil is dark gray clay, and the lower 12 inches is grayish brown clay. The underlying material is light brownish gray clay to a depth of 72 inches. Reaction is slightly acid in the upper part and moderately alkaline in the lower part.

This soil is poorly drained. A high water table is between depths of 0.5 and 3.0 feet during winter and spring. Surface runoff is slow to very slow. Permeability is very slow. Available water capacity is high. This soil is difficult to work during times of seasonal wetness. The erosion hazard is slight.

Included with this soil in mapping are small areas of Lake Charles, Edna, and Katy soils. Included soils make up less than 15 percent of any mapped area.

This soil is used for crops, range, and pasture. The main crops are corn, soybeans, and rice.

This soil is moderately well suited to pasture. Improved bermudagrass and bahiagrass are suited to this soil.

Corn, soybeans, cotton, rice, and forage sorghum are moderately well suited to this soil. Leaving crop residue on the surface helps to maintain organic matter content and tilth. Surface drainage helps to overcome seasonal wetness.

If used for range, this soil can produce moderate yields of mid and tall native grasses. Management should include stocking at proper rates and planned grazing.

This soil is poorly suited to urban and recreational uses. The main limitations are shrink-swell properties and seasonal wetness.

This soil is in capability subclass IIIw and Blackland (Coast Prairie) range site.

MdB—Midland clay loam, 1 to 3 percent slopes. This deep, gently sloping soil is on uplands. Areas are irregularly shaped and range from 20 to 100 acres in size. Slope averages 2 percent.

Typically, the surface layer is dark grayish brown, slightly acid clay loam about 8 inches thick. The upper 20 inches of the subsoil is gray, neutral clay with brown mottles; the next 12 inches is gray, moderately alkaline clay with brown mottles; and the next 8 inches is grayish brown, moderately alkaline clay. Below this is light gray, moderately alkaline clay to a depth of 70 inches.

This soil is poorly drained. A high water table is between depths of 0.5 and 3.0 feet during winter and spring. Surface runoff is slow. Permeability is very slow. Available water capacity is high. The erosion hazard is moderate.

Included with this soil in mapping are small areas of Edna, Katy, and Lake Charles soils. Included soils make up less than 20 percent of any mapped area.

This soil is used for crops, range, and pasture. The main crops are soybeans, corn, and forage sorghum.

This soil is moderately well suited to pasture. Improved bermudagrass and bahiagrass are suited to this soil.

Corn, soybeans, cotton, forage sorghum, and grain sorghum are moderately well suited to this soil. Leaving crop residue on the surface, as in minimum tillage, helps to maintain organic matter content and control erosion.

If used for range, this soil can produce moderate yields of mid and tall native grasses. Management should include stocking at proper rates and planned grazing.

This soil is poorly suited to urban and recreational uses. The main limitations are shrink-swell properties, seasonal wetness, very slow permeability, and low strength, which affects roads and streets.

This soil is in capability subclass IIIw and Blackland (Coast Prairie) range site.

Mp—Midland clay loam, depressional. This deep, nearly level soil is in irregularly shaped concave depressions. Areas range from 5 to 100 acres in size. Slope is mainly less than 0.5 percent, but ranges from 0 to 1 percent.

Typically, the surface layer is dark grayish brown clay loam about 8 inches thick. The subsoil is clay that is dark gray in the upper part and dark grayish brown in the lower part to a depth of 62 inches. Reaction is slightly acid in the surface layer and upper part of the subsoil and moderately alkaline in the lower part.

This soil is poorly drained. In most places this soil is ponded or has a high water table above a depth of 2.0 feet during wet seasons. Permeability is very slow. Available water capacity is high. The erosion hazard is none to slight.

Included with this soil in mapping are small areas of Aris, Edna, Katy, and Lake Charles soils. Also included are small areas of Midland soils that are not in depressions. Included soils make up less than 20 percent of any mapped area.

This soil is used for range or for wildlife habitat.

This soil is poorly suited to pasture because of the ponding.

This soil is not suited to crops unless it is drained and leveled.

If used for range, this soil can provide moderate yields of tall native grasses. Management should include brush control, stocking at proper rates, and planned grazing.

This soil is poorly suited to urban and recreational uses. The main problems are ponding, shrink-swell properties, very slow permeability, and low strength, which affects roads and streets.

This soil is in capability subclass VIw and Lowland range site.

MvC—Monaville loamy fine sand, 1 to 5 percent slopes. This deep, gently sloping soil is on ridges on uplands. Areas are irregularly shaped and range from 20 to 400 acres in size. Slope averages about 3 percent.

Typically, the surface layer is brown, strongly acid loamy fine sand about 15 inches thick. The subsurface layer is yellowish brown, strongly acid loamy fine sand about 13 inches thick. The subsoil is strongly acid sandy clay loam to a depth of 74 inches. From the upper part to the lower part, the subsoil ranges from light yellowish brown to pale brown to dark grayish brown to yellowish brown. The lower part contains about 10 percent plinthite masses.

This soil is moderately well drained. A perched water table is between depths of 4.0 and 5.0 feet during winter and spring. Surface runoff is slow. Permeability is moderately slow. Available water capacity is medium. The water erosion hazard is moderate, and the wind erosion hazard is severe.

Included with this soil in mapping are small areas of Hockley, Wockley, Kenney, Segno, and Katy soils. Also included are areas of a soil that is similar to Monaville soils but that has gray colors in the subsoil. Included soils make up less than 15 percent of any mapped area.

This soil is used for crops, pasture, and range (fig. 8). The main crops are corn, peanuts, and truck crops.

This soil is well suited to pasture. Improved bermudagrass, weeping lovegrass, and bahiagrass are suited to this soil.

Corn, soybeans, peanuts, small grains, and forage sorghum are well suited to this soil. Leaving crop residue on the surface, as in minimum tillage, helps to maintain organic matter content and control erosion.

If used for range, this soil can produce large yields of tall native grasses. Management should include stocking at proper rates and planned grazing.

This soil is moderately well suited to urban and recreational uses. The sandy texture is the main limitation. Seasonal wetness and shrink-swell properties are secondary limitations.

This soil is in capability subclass IIIs and Sandy Prairie range site.

Na—Nahatche loam, frequently flooded. This deep, nearly level soil is on flood plains. Floods occur at least once every 1 to 2 years, usually between November and May. Areas remain flooded for a few hours to several days. Areas are elongated and range from 50 to 2,000 acres in size.

Typically, the surface layer is grayish brown, medium acid loam about 8 inches thick. The upper 23 inches of the underlying material is stratified, grayish brown, medium acid fine sandy loam. Below this to a depth of 62 inches, the underlying material is gray, medium acid loam with dark yellowish brown mottles.

This soil is somewhat poorly drained. A high water table is at a depth of less than 20 inches mainly during winter and spring. Surface runoff is slow. Permeability is moderate. Available water capacity is medium. The erosion hazard is slight.

Included with this soil in mapping are small areas of Bosque soils and of a soil that is similar to Nahatche soils but that has stratified sandy layers throughout. Included soils make up less than 30 percent of any mapped area.

This soil is used mainly for range. Some areas are in woodland, mainly hardwoods.

This soil is well suited to pasture. Improved bermudagrass and bahiagrass are suited to this soil.

Figure 8.—Round bales of coastal bermudagrass hay on Monaville loamy fine sand.

This soil is not suited to cultivation because of the frequent flooding.

If used for range, this soil can produce large yields of tall native grasses. Management should include weed and brush control, stocking at proper rates, and planned grazing.

This soil is not suited to urban and recreational uses because of frequent flooding.

This soil is in capability subclass Vw and Loamy Bottomland range site.

NeC—Newulm loamy fine sand, 1 to 5 percent slopes. This deep, gently sloping soil is on slopes and breaks on uplands. Areas are elongated and range from 10 to 100 acres in size. Slope averages 4 percent.

Typically, the surface layer is light yellowish brown loamy fine sand about 4 inches thick. The subsurface layer is 18 inches of very pale brown loamy fine sand. The upper 31 inches of the subsoil is red sandy clay loam with strong brown mottles, and the lower part, to a depth of 80 inches, is dark red sandstone and sandy clay loam with gray mottles. Reaction is slightly acid in the surface layer and very strongly acid in the subsoil.

This soil is moderately well drained. Runoff is slow. Permeability is moderately slow. Available water capacity is medium. The erosion hazard is moderate.

Included with this soil in mapping are small areas of Tremona, Catilla, and Straber soils and small areas of nearly level Newulm soils. Also included are areas of a soil that is similar to Newulm soils but that has a sandy surface layer less than 20 inches thick. Included soils make up less than 15 percent of any mapped area.

This soil is used mainly for range. A few areas are in pasture and crops.

This soil is moderately well suited to pasture. Weeping lovegrass, improved bermudagrass, and bahiagrass are suited to this soil.

Peanuts, small grains, and forage sorghum are moderately well suited to this soil. Leaving crop residue on the surface, as in minimum tillage, helps to maintain organic matter content and control erosion.

If used for range, this soil can produce moderate yields of tall native grasses. Management should include brush control, planned grazing, and stocking at proper rates.

This soil is moderately well suited to urban and recreational uses. The sandy surface layer, seepage, and slope are the main limitations.

This soil is in capability subclass IIIs and Sandy range site.

NoA—Norwood silt loam, 0 to 1 percent slopes. This deep, nearly level soil is on slightly convex flood plains of the Brazos River. This soil is subject to flooding

about once in 20 years. Areas are elongated and range from 10 to 200 acres in size.

Typically, the surface layer is reddish brown silt loam about 10 inches thick. The next 17 inches is reddish brown silty clay loam. The upper 10 inches of the underlying material is very dark grayish brown very fine sandy loam. Below this to a depth of 63 inches is very dark grayish brown loam with strata of fine sandy loam. Reaction is moderately alkaline and calcareous throughout.

This soil is well drained. Surface runoff is slow. Permeability is moderate. Available water capacity is medium. The erosion hazard is slight.

Included with this soil in mapping are areas of Clemville, Oklared, and Brazoria soils and Norwood silty clay loam. Included soils make up less than 20 percent of any mapped area.

This soil is used mainly for pasture and crops.

This soil is well suited to pasture. Improved bermudagrass, alfalfa, and bahiagrass are suited to this soil.

Corn, cotton, soybeans, small grains, forage sorghum, and grain sorghum are well suited to this soil. Leaving crop residue on the surface helps to maintain organic matter content and tilth.

If used for range, this soil can produce large yields of mid and tall native grasses. Management should include stocking at proper rates and planned grazing.

This soil is not suited to urban uses or to most recreational uses because of the hazard of flooding.

This soil is in capability class I and Loamy Bottomland range site.

NrA—Norwood silty clay loam, 0 to 1 percent slopes. This deep, nearly level soil is on flood plains adjacent to the Brazos River. This soil is subject to flooding about once in 20 years. Areas are linear and lie along the river. The areas range from 20 acres to several hundred acres in size.

Typically, the surface layer is reddish brown silty clay loam about 16 inches thick. The upper 20 inches of the underlying material is reddish brown silt loam, the next 16 inches is light reddish brown very fine sandy loam, and the lower part is dark reddish brown clay to a depth of 72 inches. The soil is moderately alkaline and calcareous throughout.

This soil is well drained. Surface runoff is slow. Permeability is moderate. Available water capacity is high. The rooting zone is deep. Plant roots penetrate the soil easily. The erosion hazard is slight.

Included with this soil in mapping are small areas of Clemville, Oklared, and Brazoria soils and Norwood silt loam. Included soils make up less than 20 percent of any mapped area.

This soil is used for crops and pasture. Corn, grain sorghum, and truck crops do well on this soil.

This soil is well suited to pasture.

Corn, cotton, soybeans, small grains, forage sorghum, and grain sorghum are well suited to this soil. Leaving crop residue on the surface helps to maintain organic matter content and tilth.

If used for range, this soil can produce large yields of mid and tall native grasses. Management should include stocking at proper rates and planned grazing.

This soil is not suited to urban uses or to most recreational uses because of the hazard of flooding.

This soil is in capability class I and Loamy Bottomland range site.

OkA—Oklared very fine sandy loam, 0 to 1 percent slopes. This deep, nearly level soil is on flood plains adjacent to the Brazos River. This soil is flooded for short periods about once in 10 to 25 years. Soil areas are linear and lie along the river. They range from 8 to 200 acres in size.

Typically, the surface layer is brown very fine sandy loam about 8 inches thick. The upper 47 inches of the underlying material is light brown fine sandy loam. Below this to a depth of 70 inches is brown silt loam with strata of sandy loam and loamy fine sand. This soil is moderately alkaline and calcareous throughout.

This soil is well drained. A high water table is between depths of 3.5 and 5.0 feet during spring. Surface runoff is slow. Permeability is moderately rapid. Available water capacity is medium. The rooting zone is deep, and plant roots penetrate the soil easily. The erosion hazard is slight.

Included with this soil in mapping are small areas of Clemville, Norwood, and Brazoria soils. Included soils make up less than 20 percent of any mapped area.

This soil is used for crops and pasture. A few areas are in woodland.

This soil is well suited to pasture. Improved bermudagrass, alfalfa, and bahiagrass are suited to this soil.

Corn, grain sorghum, small grains, forage sorghum, soybeans, and truck crops are well suited to this soil. Leaving crop residue on the surface helps to maintain organic matter content and tilth.

If used for range, this soil can produce large yields of native grasses. Management should include stocking at proper rates and planned grazing.

This soil is not suited to urban uses or to most recreational uses because of the hazard of flooding.

This soil is in capability class I and Loamy Bottomland range site.

On—Oklared-Norwood complex, frequently flooded. These deep, gently undulating soils are on flood plains (fig. 9). These soils are flooded one or more times every year for very brief periods. Areas are irregular in shape and range form 30 to 400 acres in

Figure 9.—Flooding in an area of Oklared-Norwood complex, frequently flooded.

size. Slope ranges from 1 to 8 percent but averages about 2 percent. The Oklared soil makes up about 55 percent of this complex, the Norwood soil makes up 35 percent, and other soils make up 10 percent. The areas of these soils are so intricately mixed that separating them is not feasible at the scale of mapping.

Typically, the Oklared soil has a surface layer of dark brown very fine sandy loam about 4 inches thick. The upper 35 inches of the underlying material is light brown very fine sandy loam with thin strata of loam and fine sandy loam. Below this to a depth of 60 inches is pink very fine sandy loam with thin strata of silt loam and fine sandy loam. This soil is moderately alkaline and calcareous throughout.

The Oklared soil is well drained. A high water table is between depths of 3.5 and 5.0 feet during spring. Surface runoff is slow. Permeability is moderately rapid. Available water capacity is medium. The erosion hazard is slight.

Typically, the Norwood soil has a surface layer of dark brown loam about 8 inches thick over 7 inches of dark reddish brown silty clay loam. The underlying material is 20 inches of reddish brown loam over reddish brown, stratified very fine sandy loam and silt loam to a depth of 60 inches. This soil is moderately alkaline and calcareous throughout.

The Norwood soil is well drained. Surface runoff is slow. Permeability is moderate. Available water capacity is high. The erosion hazard is slight.

Included with these soils in mapping are small areas of Brazoria, Clemville, and Sumpf soils. Also included are a

few small areas of poorly drained soils. Included soils make up less than 15 percent of any mapped area.

These soils are used for pasture and range. A few areas are in woodland. The vegetation is mainly cottonwood, pecan, and elm with bermudagrasss and annual grasses.

These soils are well suited to pasture. Improved bermudagrass is suited to these soils.

These soils are not suited to crops because of the hazard of flooding.

If used for range, these soils can produce large yields of tall native grasses. Management should include stocking at proper rates and planned grazing.

These soils are not suited to urban and recreational uses. The main limitation is the flooding.

This complex is in capability subclass Vw and Loamy Bottomland range site.

RaA—Rader fine sandy loam, 0 to 1 percent slopes. This deep, nearly level soil is on uplands on ancient stream terraces. Areas are irregular in shape and range from 10 to 500 acres in size. Slope averages 0.5 percent.

Typically, the surface layer is grayish brown, slightly acid fine sandy loam about 6 inches thick. The subsurface layer is brown, slightly acid fine sandy loam 9 inches thick. The upper 8 inches of the subsoil is light yellowish brown, slightly acid sandy clay loam with light gray mottles; and the lower part, to a depth of 65 inches, is light gray sandy clay with yellowish red and yellowish brown mottles.

This soil is moderately well drained. A perched water table is between depths of 2.0 and 5.0 feet during winter and spring. Surface runoff is slow. Permeability is very slow. Available water capacity is medium. The erosion hazard is slight.

Included with this soil in mapping are small areas of Chazos, Lufkin, Styx, Tabor, and Tremona soils. Also included are small areas that are ponded in wet seasons. Included soils make up less than 20 percent of any mapped area.

This soil is used for range, pasture, and crops.

This soil is well suited to pasture. Improved bermudagrass and bahiagrass are suited to this soil.

Corn, peanuts, soybeans, cotton, forage sorghum, small grains, and grain sorghum are moderately well suited to this soil. Surface drainage helps to overcome seasonal wetness. Leaving crop residue on the surface helps to maintain organic matter content and tilth.

If used for range, this soil can produce moderate yields of mid and tall native grasses. Management should include stocking at proper rates and planned grazing.

This soil is moderately well suited to urban and recreational uses. The main limitations are seasonal wetness, shrink-swell properties, and low strength, which affects roads and streets.

This soil is in capability subclass IIw and Sandy Loam range site.

RaB—Rader fine sandy loam, 1 to 3 percent slopes. This deep, gently sloping soil is on uplands on ancient stream terraces. Areas are irregular in shape and range from 10 to 100 acres in size. Slope averages 2 percent.

Typically, the surface layer is dark brown, slightly acid fine sandy loam about 5 inches thick. The subsurface layer is brown, slightly acid fine sandy loam 11 inches thick. The upper 6 inches of the subsoil is grayish brown, medium acid fine sandy loam; the next 6 inches is yellowish brown, strongly acid sandy clay loam; the next 14 inches is dark grayish brown, strongly acid clay loam; the next 10 inches is yellowish brown, medium acid clay loam; the next 8 inches is dark gray, neutral sandy clay loam; and the lower part is light brownish gray, moderately alkaline sandy clay loam to a depth of 78 inches. The subsoil has common brownish and grayish and few reddish mottles throughout.

This soil is moderately well drained. A perched water table is between depths of 2.0 and 5.0 feet during winter and spring. Surface runoff is slow. Permeability is very slow. Available water capacity is medium. The erosion hazard is slight.

Included with this soil in mapping are small areas of Chazos, Lufkin, Styx, Tabor, and Tremona soils. Included soils make up less than 20 percent of any mapped area.

This soil is used for pasture, range, and crops.

This soil is well suited to pasture. Improved bermudagrass and bahiagrass are suited to this soil.

Corn, peanuts, cotton, soybeans, small grain, forage sorghum, and grain sorghum are moderately well suited to this soil. Leaving crop residue on the surface helps to maintain organic matter content and tilth.

If used for range, this soil can produce large yields of tall and mid native grasses. Management should include stocking at proper rates and planned grazing.

This soil is moderately well suited to urban and recreational uses. Shrink-swell properties, wetness, and low strength, which affects roads and streets, are limitations.

This soil is in capability subclass IIe and Sandy Loam range site.

ReF—Renish clay loam, 5 to 20 percent slopes. This shallow, sloping soil is on upland ridges. Areas are irregularly shaped and range from 5 to 50 acres in size. Slope averages about 7 percent.

Typically, the surface layer is very dark grayish brown, moderately alkaline clay loam about 12 inches thick. The next 3 inches is very dark grayish brown, moderately alkaline clay loam containing about 40 percent

sandstone fragments. The underlying material is moderately alkaline, calcareous sandstone.

This soil is well drained. Surface runoff is rapid. Permeability is moderate. Available water capacity is very low. The erosion hazard is severe.

Included with this soil in mapping are areas of Klump, Carbengle, Brenham, Frelsburg, and Latium soils. Also included are a few rock outcrops. The included soils and rock outcrops make up less than 15 percent of any mapped area.

This soil is used for range.

This soil is poorly suited to pasture or crops because of the stones and the slope.

If used for range, this soil produces small yields of short, mid, and tall native grasses. Management should include stocking at proper rates and planned grazing.

This soil is poorly suited to urban and recreational uses. The main limitations are depth to rock and slope.

This soil is in capability subclass VIe and Chalky Ridge range site.

SeC—Sealy loamy fine sand, 0 to 5 percent slopes. This deep, gently sloping soil is on upland footslopes. Areas range from 20 to 300 acres in size. Slope averages 2.5 percent.

Typically, the surface layer is dark grayish brown loamy fine sand about 6 inches thick. The subsurface layer is 42 inches of loamy fine sand that is grayish brown in the upper part and gray in the lower part. The upper 14 inches of the subsoil is light gray sandy clay loam with brownish yellow mottles, and the lower part, to a depth of 72 inches, is light gray sandy clay loam with brownish yellow and dark reddish brown mottles. Reaction is very strongly acid throughout.

This soil is poorly drained. There is a perched water table most of the year. Surface runoff is slow. Permeability is rapid in the surface layer and moderately slow in the subsoil. Available water capacity is low to medium; however, the soil is saturated most of the year.

Included with this soil in mapping are small areas of Tremona, Catilla, Kenney, Monaville, and Waller soils. Also included are a few areas of Sealy fine sandy loam. Included soils make up less than 15 percent of any mapped area.

This soil is used mainly for range.

This soil is moderately well suited to pasture; but because of the wetness, establishing grasses is difficult.

This soil is not suited to cultivation because of wetness.

If used for range, this soil can produce moderate yields of tall native grasses. Management should include brush control, stocking at proper rates, and planned grazing.

This soil is poorly suited to urban and recreational uses. The main limitation is wetness.

This soil is in capability subclass VIw and Wet Sandy Draw range site.

SgC—Segno fine sandy loam, 1 to 5 percent slopes. This deep, gently sloping soil is on uplands. Areas are irregularly shaped and range from 20 to 300 acres in size. Slope averages about 3 percent.

Typically, the surface layer is grayish brown fine sandy loam about 5 inches thick. The subsurface layer is 10 inches of fine sandy loam that is dark grayish brown in the upper part and brown in the lower part. The subsoil, to a depth of 72 inches, is sandy clay loam that is yellow in the upper part and mottled with shades of yellow, gray, and red in the lower part. Reaction is strongly acid throughout.

This soil is moderately well drained. Surface runoff is medium. Permeability is moderately slow. Available water capacity is medium. The erosion hazard is moderate.

Included with this soil in mapping are small areas of Conroe, Hockley, Wockley, Fetzer, and Splendora soils. Also included are areas of a soil that is similar to Segno soils but that has a loamy fine sand surface layer. Included soils make up less than 20 percent of any mapped area.

This soil is used for pasture, woodland, and crops. Some areas have been developed for urban uses.

This soil is well suited to pasture. Improved bermudagrass and bahiagrass are suited to this soil.

Corn, peanuts, small grains, forage sorghum, and truck crops are well suited to this soil. Leaving crop residue on the surface helps to maintain organic matter content and tilth and control erosion. Minimum tillage also helps to control erosion.

If used for grazing, this soil can produce large yields of tall native grasses. Many areas currently have a dense canopy of pine and hardwoods. Management should include tree thinning, stocking at proper rates, and planned grazing.

This soil is moderately well suited to urban and recreational uses. The main limitation is seasonal wetness.

This soil is in capability subclass IIIe.

SlC—Sllawa loamy fine sand, 1 to 5 percent slopes. This deep, gently sloping soil is on upland breaks on ancient stream terraces. Areas are elongated and are 5 to 50 acres in size. Slope averages about 4 percent.

Typically, the surface layer is about 10 inches of dark brown loamy fine sand. The upper 8 inches of the subsoil is dark red sandy clay loam with dark brown mottles, the next 18 inches is yellowish red sandy clay loam with yellowish brown mottles, the next 12 inches is yellowish red sandy clay loam with yellowish brown mottles, and the lower part is yellowish red fine sandy loam to a depth of 65 inches. Reaction is medium acid in the surface layer and strongly acid in the subsoil.

This soil is well drained. Surface runoff is slow. Permeability is moderate. Available water capacity is medium. The erosion hazard is moderate.

Included with this soil in mapping are small areas of Chazos, Kenney, Styx, Tabor, and Dutek soils. Also included are areas of a soil that is similar to Silawa soils but that has a more clayey subsoil. Also included are small areas of sloping Silawa soils. Included soils make up less than 20 percent of any mapped area.

This soil is used for pasture, range, and crops.

This soil is well suited to pasture. Improved bermudagrass, bahiagrass, and weeping lovegrass are suited to this soil.

Corn, peanuts, cotton, small grains, forage sorghum, grain sorghum, and truck crops are well suited to this soil. This soil is also suited for fruit orchards. Leaving crop residue on the surface helps to maintain organic matter content and control erosion. Minimum tillage also helps to control erosion.

If used for range, this soil can produce large yields of mid and tall native grasses. Management should include brush control, stocking at proper rates, and planned grazing.

This soil is suited to recreational and urban uses. The main limitations are seepage and slope in a few places.

This soil is in capability subclass IIIe and Loamy Sand range site.

SlD—Silawa loamy fine sand, 5 to 8 percent slopes. This deep, sloping soil is on upland ridges and breaks on ancient stream terraces. Soil areas are elongated and range from 5 to 50 acres in size. Slope averages about 7 percent.

Typically, the surface layer is slightly acid, brown loamy fine sand about 12 inches thick. The upper 8 inches of the subsoil is very strongly acid, yellowish red sandy clay loam, the next 35 inches is strongly acid, yellowish red sandy clay loam, and the lower part is medium acid, yellowish red fine sandy loam to a depth of 80 inches.

This soil is well drained. Surface runoff is medium. Permeability is moderate. Available water capacity is medium. The wind and water erosion hazards are severe.

Included with this soil in mapping are small areas of Chazos, Kenney, Styx, and Tabor soils. Also included are areas of a soil that is similar to Silawa soils but that has a more clayey subsoil. Also included are small areas of graded Silawa soils that have a thinner surface layer. Included soils make up about 20 percent of any mapped area.

This soil is used for pasture, range, and wildlife habitat. Some areas are in crops.

This soil is well suited to pasture. Improved bermudagrass, bahiagrass, and weeping lovegrass are suited to this soil.

This soil is fairly suited to small grains and forage sorghum. This soil is also suited to fruit orchards. Leaving crop residue on the surface helps to control erosion and maintain organic matter content. Minimum tillage helps to control erosion.

If used for range, this soil can produce moderate yields of mid and tall native grasses. Management should include brush control, planned grazing, and stocking at proper rates.

This soil is moderately well suited to urban and recreational uses. The main limitation is slope.

This soil is in capability subclass IVe and Loamy Sand range site.

SpB—Splendora fine sandy loam, 0 to 3 percent slopes. This deep, nearly level to gently sloping soil is on broad uplands. Areas range from 20 to 1,000 acres in size. Slope averages about 0.8 percent.

Typically, the surface layer is fine sandy loam about 13 inches thick that is light brownish gray in the upper part and pale brown in the lower part. The next 7 inches is mixed grayish brown sandy clay loam and very pale brown fine sandy loam. The subsoil is grayish brown and light gray sandy clay loam to a depth of 60 inches. Reaction is slightly to medium acid in the surface layer and strongly acid in the subsoil.

This soil is somewhat poorly drained. A perched water table is between depths of 0.5 and 2.0 feet during winter and spring. Surface runoff is slow. Permeability is slow. Available water capacity is medium. This soil is difficult to work at times of seasonal wetness. The erosion hazard is slight.

Included with this soil in mapping are small areas of Waller, Boy, Fetzer, and Depcor soils. Also included are small depressions that are ponded most of the time. Included soils make up less than 15 percent of any mapped area.

This soil is used for crops, pasture, and woodland.

This soil is well suited to pasture. Improved bermudagrass and bahiagrass are suited to this soil.

This soil is moderately well suited to corn, small grains, and forage sorghum. Surface drainage helps to remove excess water during wet seasons. Leaving crop residue on the surface helps to maintain organic matter content and tilth.

If used for grazing, this soil can produce moderate yields of tall native grasses. Most areas currently have a dense stand of hardwood and pine. Management should include thinning trees, stocking at proper rates, and planned grazing.

This soil is poorly suited to urban and recreational development. The main problem is seasonal wetness.

This soil is in capability subclass IIIe.

SrC—Straber loamy fine sand, 1 to 5 percent slopes. This deep, gently sloping soil is on ridges and

footslopes. Areas are irregularly shaped and range from 10 to 100 acres in size. Slope averages about 3 percent.

Typically, the surface layer is 3 inches of light brownish gray, slightly acid loamy fine sand. The subsurface layer is 13 inches of light gray, slightly acid loamy fine sand. The upper 29 inches of the subsoil is yellowish brown, very strongly acid clay; the next 20 inches is light gray, strongly acid clay; and the lower part is light brownish gray, medium acid clay to a depth of 75 inches. The subsoil has common grayish, reddish, and yellowish mottles throughout.

This soil is moderately well drained. Surface runoff is slow. Permeability is slow. Available water capacity is medium. Plant roots have difficulty penetrating the clayey subsoil. The erosion hazard is moderate.

Included with this soil in mapping are small areas of Axtell, Catilla, Newulm, Tabor, and Tremona soils. Included soils make up less than 20 percent of any mapped area.

This soil is used mostly for range and pasture. A few areas are in crops.

This soil is well suited to pasture. Improved bermudagrass, bahiagrass, and weeping lovegrass are suited to this soil.

Corn, peanuts, truck crops, small grains, and forage sorghum are well suited to this soil. Leaving crop residue on the surface helps to control erosion and maintain organic matter content. Minimum tillage also helps to control erosion.

If used for range, this soil can produce moderate yields for tall native grasses. Management should include brush control, stocking at proper rates, and planned grazing.

This soil is moderately well suited to urban and recreational uses. Very slow permeability, seasonal wetness, and shrink-swell properties are the main limitations.

This soil is in capability subclass IIIe and Loamy Sand range site.

SrD—Straber loamy fine sand, 5 to 8 percent slopes. This deep, gently rolling soil is on upland ridges and footslopes. Areas are irregularly shaped and range from 5 to 50 acres in size. Slope averages about 7 percent.

Typically, the surface layer is about 15 inches of medium acid loamy fine sand that is dark brown in the upper part and yellowish brown in the lower part. The upper 10 inches of the subsoil is strongly acid, strong brown sandy clay with red and light brownish gray mottles; the next 15 inches is strongly acid, red sandy clay with strong brown mottles; and the lower part is neutral, yellowish red, sandy clay loam to a depth of 72 inches.

This soil is moderately well drained. Surface runoff is slow. Permeability is very slow. Available water capacity is medium. Plant roots have difficulty penetrating the clayey subsoil. The erosion hazard is severe.

Included with this soil in mapping are small areas of Axtell, Catilla, Newulm, Tabor, and Tremona soils. Included soils make up less than 20 percent of any mapped area.

This soil is used for pasture and range.

This soil is well suited to pasture. Improved bermudagrass, weeping lovegrass, and bahiagrass are suited to this soil.

This soil is moderately well suited to small grains and forage sorghums. Leaving crop residue on the surface helps to control erosion and maintain organic matter content. Minimum tillage also helps to control erosion.

If used for range, this soil can produce moderate yields of tall native grasses. Many areas currently have thick stands of hardwoods. Management should include brush control, stocking at proper rates, and planned grazing.

This soil is moderately well suited to urban and recreational uses. The limitations include moderate shrink-swell properties, very slow permeability, and slope.

This soil is in capability subclass IVe and Loamy Sand range site.

StC—Styx loamy fine sand, 1 to 5 percent slopes. This deep, gently sloping soil is on smooth upland ridges on ancient stream terraces. Areas are irregularly shaped and range from 5 to 100 acres in size. Slope averages 3 percent.

Typically, the surface layer is about 10 inches of yellowish brown loamy fine sand. The subsurface layer is 12 inches of very pale brown loamy fine sand. The subsoil to a depth of 80 inches is sandy clay loam that grades from yellowish brown in the upper part to mottled reds, browns, and grays in the middle part to red in the lower part. Reaction is strongly acid throughout.

This soil is well drained. A perched water table is between depths of 3.5 and 4.5 feet during winter and spring. Surface runoff is slow. Permeability is moderate. Available water capacity is medium. The erosion hazard is moderate.

Included with this soil in mapping are small areas of Chazos, Dutex, Kenney, Silawa, Tabor, and Tremona soils. Also included are a few small areas of sloping Styx soils. Included soils make up less than 20 percent of any mapped area.

This soil is used for pasture, range, and crops.

This soil is well suited to pasture. Improved bermudagrass, weeping lovegrass, and bahiagrass are suited to this soil.

Corn, peanuts, grain sorghum, soybeans, small grains, forage sorghum, watermelons, and truck crops are well suited to this soil. Leaving crop residue on the surface

helps to maintain organic matter content and control erosion. Minimum tillage also helps to control erosion.

If used for range, this soil can produce large yields of tall native grasses. Management should include stocking at proper rates and planned grazing.

This soil is moderately well suited to urban and recreational uses. The main limitations are sandy texture and seasonal wetness. Cutbanks of excavations tend to cave in.

This soil is in capability subclass IIIe and Sandy range site.

Su—Sumpf clay, frequently flooded. This deep, nearly level soil is on flood plains in oxbow channels that at one time were part of the channel of the Brazos River. This soil is flooded periodically throughout the year. Areas are elongated and range from 5 to 50 acres in size.

Typically, the surface layer is dark brown clay about 15 inches thick. Below this is 7 inches of dark reddish brown clay. The underlying material is 3 inches of reddish brown silty clay loam over reddish brown clay to a depth of 60 inches. This soil is moderately alkaline and calcareous throughout.

This soil is very poorly drained. This soil is ponded much of the year and at other times has a high water table above a depth of 2 feet. Permeability is very slow. Available water capacity is high. The erosion hazard is slight.

Included with this soil in mapping are small areas of Clemville, Brazoria, Norwood, and Oklared soils. Also included are areas that are ponded most of the year. Included soils make up less than 20 percent of any mapped area.

This soil is used for range or wildlife habitat.

This soil is not suited to pasture or crops because of the flooding and wetness.

If used for range, this soil can produce moderate yields of tall native grasses. Management should include stocking at proper rates, brush control, and planned grazing.

This soil is poorly suited to urban and recreational uses because of wetness and flooding.

This soil is in capability subclass VIw and Clayey Bottomland range site.

TaC—Tabor fine sandy loam, 1 to 5 percent slopes. This deep, gently sloping soil is on upland ridges. Areas are irregularly shaped and range from 10 to 100 acres in size. Slope averages about 3 percent.

Typically, the surface layer is about 9 inches of brown fine sandy loam. The subsurface layer is 6 inches of very pale brown fine sandy loam. The subsoil, a depth of 69 inches, is clay that is yellowish brown in the upper part, light gray in the middle part, and light brownish gray in the lower part. This soil is very strongly acid in the surface layer and grades to moderately alkaline in the lower part.

This soil is moderately well drained. Surface runoff is medium. Permeability is very slow. Available water capacity is high. This soil is difficult to work, and plant roots have difficulty penetrating the clayey subsoil. The erosion hazard is moderate.

Included with this soil in mapping are small areas of Axtell, Chazos, Crockett, Lufkin, Rader, and Tremona soils. Included also are small areas of Tabor soils having slopes less than 1 percent. Included soils make up less than 15 percent of any mapped area.

This soil is used for pasture, range, and crops.

This soil is well suited to pasture. Improved bermudagrass and bahiagrass are suited to this soil.

Corn, cotton, forage sorghum, grain sorghum, small grains, and truck crops are moderately well suited to this soil. Leaving crop residue on the surface helps to maintain organic matter content and control erosion. Minimum tillage also helps to control erosion.

If used for range, this soil can produce moderate yields of mid and tall native grasses. Management should include brush control, stocking at proper rates, and planned grazing.

This soil is poorly suited to urban and recreational uses. The main limitations are shrink-swell properties, very slow permeability, and low strength, which affects roads and streets.

This soil is in capability subclass IVe and Sandy Loam range site.

TeC—Tremona loamy fine sand, 1 to 5 percent slopes. This deep, gently sloping soil is on broad upland foot slopes. Areas are irregularly shaped and range from 20 to 400 acres. Slope averages 2 percent.

Typically, the surface layer is about 6 inches of dark brown loamy fine sand. The subsurface layer is 20 inches thick and is light brown loamy fine sand in the upper part and gravelly loamy fine sand in the lower part. The upper 22 inches of the subsoil is grayish brown clay, and the lower 7 inches is light gray sandy clay. The underlying material is dark yellowish brown clay to a depth of 70 inches. Reaction is medium acid to strongly acid in the surface layer and very strongly acid in the subsoil.

This soil is somewhat poorly drained. A perched water table is between depths of 1.5 and 3.5 feet during summer. Surface runoff is slow. Permeability is very slow. Available water capacity is medium. The water and wind erosion hazards are moderate.

Included with this soil in mapping are small areas of Straber, Catilla, Axtell, and Newulm soils. Included soils make up less than 15 percent of any mapped area.

This soil is used for range, pasture, and crops.

This soil is well suited to pasture. Improved bermudagrass, weeping lovegrass, and bahiagrass are suited to this soil.

Corn, peanuts, cotton, grain sorghum, small grains, truck crops, and forage sorghum are moderately well suited to this soil. Leaving crop residue on the surface helps to maintain organic matter content and control erosion. Minimum tillage also helps to control erosion.

If used for range, this soil can produce moderate yields of tall native grasses. Management should include brush control, planned grazing, and stocking at proper rates.

This soil is poorly suited to urban and recreational uses. The main limitations are wetness, very slow permeability, sandy surface layer, and shrink-swell properties.

This soil is in capability subclass IIIe and Sandy range site.

TeD—Tremona loamy fine sand, 5 to 8 percent slopes. This deep, sloping soil is on uplands. Areas are elongated and range from 5 to 100 acres in size. Slope averages 6 percent.

Typically, the surface layer is about 6 inches of brown loamy fine sand. The subsurface layer is 15 inches of loamy fine sand that is pale brown in the upper part and very pale brown in the lower part. The subsoil, to a depth of 74 inches, is clay that is grayish brown in the upper part, light brownish gray in the middle part, and gray in the lower part. Brownish and reddish mottles are throughout. The surface layer is medium acid and the rest is strongly acid.

This soil is somewhat poorly drained. A perched water table is between depths of 1.5 and 3.5 feet during summer. Surface runoff is medium. Permeability is very slow. Available water capacity is medium. The water erosion hazard is severe, and the wind erosion hazard is moderate.

Included with this soil in mapping are small areas of Straber, Catilla, Axtell, and Newulm soils. Also included are small areas of gently sloping Tremona soils. Included soils make up less than 15 percent of any mapped area.

This soil is used for range, pasture, and wildlife habitat.

This soil is well suited to pasture. Improved bermudagrass, weeping lovegrass, and bahiagrass are suited to this soil.

This soil is moderately well suited to small grains and forage sorghum. Leaving crop residue on the surface helps to control erosion and maintain organic matter content. Minimum tillage also helps to control erosion.

If used for range, this soil can produce moderate yields of tall native grasses. Management should include brush control, stocking at proper rates, and planned grazing.

This soil is poorly suited to urban and recreational uses. The main limitations are wetness, very slow permeability, slope, and shrink-swell properties.

This soil is in capability unit IVe and Sandy range site.

Tr—Trinity clay, frequently flooded. This deep, nearly level soil is on flood plains of major streams. This soil floods one or more times in most years during spring or fall. Areas are linear and range from 10 to more than 2,000 acres in size.

Typically, the surface layer is black clay about 16 inches thick. The next 18 inches is very dark gray clay. Below this is black clay to a depth of 65 inches. This soil is calcareous and moderately alkaline throughout.

This soil is somewhat poorly drained. A high water table is between the surface and a depth of 3.0 feet during late winter and spring. Permeability is very slow. Available water capacity is high. Runoff is very slow and water ponds for a few hours following rains. When the soil is dry and cracked, water enters rapidly; but when the soil is wet and the cracks have closed, water enters very slowly. The erosion hazard is none to slight.

Included with this soil in mapping are small areas of Bosque and Nahatche soils. Also included along stream banks are areas of a soil that is loamy sand throughout. Also included near the confluence of Mill Creek and the Brazos River are small areas of Brazoria soils. Included soils make up less than 15 percent of any mapped area.

This soil is used for pasture, range, and wildlife habitat. A few areas are cropped to small grains and forage sorghum. Some areas are in hardwoods.

This soil is well suited to pasture. Improved bermudagrass and native grasses are suited to this soil. Many native meadows are managed for hay.

This soil is not suited to cultivation because of frequent flooding; however, areas that are protected from flooding can produce excellent yields of most crops grown in the area.

If used for range, this soil can produce large yields of mid and tall native grasses. Management should include brush and weed control, stocking at proper rates, and planned grazing.

This soil is not suited to urban and recreational uses because of the hazard of flooding.

This soil is in capability subclass Vw and Clayey Bottomland range site.

Wa—Waller loam, depresssional. This deep, nearly level soil is in irregularly shaped concave depressions on uplands. Areas range from 5 to 100 acres in size. Slope is mainly less than 0.5 percent.

Typically, the surface layer and subsurface layer, to a depth of 22 inches, is light brownish gray loam. The subsoil, to a depth of 65 inches, is clay loam that is gray with strong brown mottles and contains tongues of fine

sandy loam and silt loam throughout. Reaction is very strongly acid to medium acid in the surface layer and very strongly acid in the subsoil.

This soil is poorly drained. This soil is ponded or has a high water table above a depth of 1.0 foot during winter and spring. Surface runoff is very slow to ponded. Permeability is moderate. Available water capacity is high. This soil is difficult to work when saturated. The erosion hazard is slight.

Included with this soil in mapping are small areas of Katy, Wockley, Aris, and Splendora soils. Included soils make up less than 15 percent of any mapped area.

This soil is used for range, wildlife habitat, and pasture. A few areas are cultivated to rice.

This soil is poorly suited to pasture. Improved bermudagrass and bahiagrass will grow but most areas need drainage.

This soil is not suited to crops because of wetness. Drained areas are suitable.

If used for range, this soil can produce moderate yields of tall native grasses. Management should include stocking at proper rates and planned grazing.

This soil is poorly suited to urban and recreational uses. The main limitations are wetness and poor drainage.

This soil is in capability subclass Vlw and Loamy Prairie range site.

WlA—Wilson clay loam, 0 to 1 percent slopes. This deep, nearly level soil is on ancient terraces on uplands. Areas are irregular in shape and range from 20 acres to several hundred acres in size. Slope averages 0.5 percent.

Typically, the surface layer is very dark gray clay loam about 7 inches thick. The upper 16 inches of the subsoil is dark gray silty clay, and the lower part, to a depth of 64 inches, is dark gray and dark grayish brown clay with dark gray and yellowish brown mottles. Reaction is neutral in the upper part and moderately alkaline in the lower part.

This soil is somewhat poorly drained. A perched water table is between the surface and a depth of 1.0 foot for long periods during winter and spring. Surface runoff is slow. Permeability is very slow. Available water capacity is medium. This soil is difficult to till during extremes in moisture content. The erosion hazard is slight.

Included with this soil in mapping are small areas of Bleiblerville, Burleson, Crockett, Frelsburg, Mabank, and Tabor soils. Included soils make up less than 20 percent of any mapped area.

This soil is used for pasture, range, and crops.

This soil is well suited to pasture. Improved bermudagrass and kleingrass are suited to this soil.

Corn, small grains, forage sorghum, soybeans, and grain sorghum are moderately well suited to this soil. Leaving crop residue on the surface helps to maintain tilth and organic matter content and control erosion. Bedding land in fall helps to overcome spring wetness. Drainage helps to remove excess water.

If used for range, this soil can produce moderate yields of mid and tall native grasses. Management should include stocking at proper rates and planned grazing.

This soil is poorly suited to urban and recreational uses. The main limitations are shrink-swell properties, very slow permeability, and wetness.

This soil is in capability subclass IIIw and Claypan Prairie range site.

WlB—Wilson clay loam, 1 to 3 percent slopes. This deep, gently sloping soil is on uplands on ancient stream terraces. Areas are irregularly shaped and range from 10 to 100 acres in size. Slope averages 2 percent.

Typically, the surface layer is 8 inches of very dark gray clay loam. The upper 19 inches of the subsoil is dark gray silty clay; the next 20 inches is gray clay with common, fine, faint, gray and brown mottles; and the lower part, to a depth of 61 inches, is clay mottled in shades of gray and brown. Reaction is neutral in the surface layer and moderately alkaline in the subsoil.

This soil is somewhat poorly drained. A perched water table is between the surface and a depth of 1.0 foot for long periods during winter and spring. Surface runoff is slow. Permeability is very slow. Available water capacity is medium. The soil is generally difficult to work because of the wetness. The erosion hazard is moderate.

Included with this soil in mapping are small areas of Bleiblerville, Burleson, Crockett, Frelsburg, Mabank, and Tabor soils. Included soils make up less than 20 percent of any mapped area.

This soil is used for range, pasture, and crops.

This soil is well suited to pasture. Improved bermudagrass and kleingrass are suited to this soil.

Corn, grain sorghum, small grains, soybeans, and forage sorghum are moderately well suited to this soil. Terraces and contour farming help to control erosion. Leaving crop residue on the surface helps to maintain tilth and organic matter content and control erosion.

If used for range, this soil can produce moderate yields of mid and tall native grasses. Management should include stocking at proper rates and planned grazing.

This soil is poorly suited to urban and recreational uses. The main limitations are wetness, shrink-swell properties, and very slow permeability.

This soil is in capability subclass IIIe and Claypan Prairie range site.

WoA—Wockley fine sandy loam, 0 to 1 percent slopes. This deep, nearly level soil is on broad uplands. Areas range from 20 to more than 1,000 acres in size. Slope averages 0.5 percent.

Typically, the surface layer is about 12 inches of dark grayish brown fine sandy loam. The subsurface layer is 11 inches of brown fine sandy loam. The upper 33 inches of the subsoil is light brownish gray sandy clay loam over light gray clay loam. The lower part of the subsoil, to a depth of 80 inches, is brownish yellow clay loam with gray and red mottles. Reaction is medium acid in the surface layer and upper part of the subsoil and slightly acid in the lower part.

This soil is somewhat poorly drained. A perched water table is between the surface and a depth of 2.0 feet during winter and spring. Surface runoff is slow. Permeability is moderately slow. Available water capacity is high. The soil is difficult to work during times of seasonal wetness. The erosion hazard is slight.

Included with this soil in mapping are areas of Hockley, Waller, Monaville, Edna, Katy, Aris, Fetzer, and Splendora soils. Included soils make up less than 20 percent of any mapped area.

This soil is used for crops, pasture, and range.

This soil is well suited to pasture. Improved bermudagrass and bahiagrass are suited to this soil.

Corn, peanuts, soybeans, small grains, forage sorghum, and grain sorghum are well suited to this soil. Leaving crop residue on the surface helps to maintain organic matter content and tilth. Minimum tillage also helps to control erosion.

If used for range, this soil can produce large yields of tall native grasses. Management should include stocking at proper rates and planned grazing.

This soil is moderately well suited to urban and recreational uses. The main limitations are wetness and moderately slow permeability.

This soil is in capability subclass IIIw and Loamy Prairie range site.

WoB—Wockley fine sandy loam, 1 to 3 percent slopes. This deep, gently sloping soil is on broad uplands. Areas are irregularly shaped and range from 10 to 50 acres in size. Slope averages 2 percent.

Typically, the surface layer is about 22 inches of fine sandy loam that is grayish brown in the upper part and dark brown in the lower part. The upper 33 inches of the subsoil is brown and dark brown sandy clay loam with gray, yellow, and red mottles; the lower part, to a depth of 72 inches, is white, yellow, and red, reticulately mottled sandy clay loam. Reaction is slightly acid to medium acid in the surface layer and medium acid in the subsoil.

This soil is somewhat poorly drained. A perched water table is between the surface and a depth of 2.0 feet during winter and spring. Runoff is slow. Permeability is moderately slow. Available water capacity is high. This soil is difficult to work during times of wetness. The erosion hazard is moderate.

Included with this soil in mapping are small areas of Edna, Hockley, Katy, Midland, Monaville, and Waller soils. Included soils make up less than 20 percent of any mapped area.

This soil is used for crops, range, and pasture.

This soil is well suited to pasture. Improved bermudagrass and bahiagrass are suited to this soil.

Corn, peanuts, small grains, forage sorghum, and grain sorghum are well suited to this soil. Leaving crop residue on the surface helps to control erosion and maintain tilth and organic matter content. Minimum tillage also helps to control erosion.

If used for range, this soil can produce large yields of tall native grasses. Management should include stocking at proper rates and planned grazing.

This soil is moderately well suited to urban and recreational uses. The main limitations are wetness and moderately slow permeability.

This soil is in capability subclass IIIw and Loamy Prairie range site.

prime farmland

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to producing food, feed, forage, fiber, and oilseed crops. The soil quality, growing season, and moisture supply are suitable for economically producing sustained high yields of crops if the land is treated and managed using acceptable farming methods. Prime farmland produces the highest yields with minimal inputs of energy and economic resources, and farming it results in the least damage to the environment. Prime farmland is of major importance in satisfying the nation's short- and long-term needs for food and fiber. The supply of high quality farmland is limited, however, and it should be used with wisdom and foresight.

Prime farmland must either be currently used for producing food or fiber or be available for this use. It may be in crops, pasture, timber, or other uses except urban or built-up land or water areas. Urban or built-up land is any contiguous area 10 acres or more in size that is used for residences, industrial sites, commercial sites, construction sites, institutional sites, public administrative sites, railroad yards, small parks, cemeteries, airports, golf courses, sanitary landfills, sewage treatment plants, water control structures and spillways, shooting ranges, and so forth.

Prime farmland usually has an adequate and dependable supply of moisture from precipitation or irrigation. Temperature and growing season are favorable. It has acceptable reaction and has few or no rocks, and it is permeable to water and air. Prime farmland is not excessively erodible. It is not saturated with water for long periods and is not flooded during the

growing season. Slope ranges mainly from 0 to 5 percent.

Soils that have limitations—a high water table, flooding, or inadequate rainfall—may qualify as prime farmland if the limitations are overcome by such measures as drainage, flood control, or irrigation.

About 171,000 acres (40 percent) of Austin County and 190,000 acres (58 percent) of Waller County meet the requirements for prime farmland. These areas are scattered throughout the survey area, but general soil map associations 1, 2, 3, 7, 9, and 14 have the largest areas of prime farmland. Associations 10, 11, 12, and 13 have substantial areas, but associations 4, 5, 6, 8, and 15 have only scattered areas. Approximately 90,000 acres of prime farmland in Waller County and 60,000 acres in Austin County are used for cultivated crops. Crops grown on these soils—mainly rice, corn, soybeans, and peanuts—account for about 30 percent of the agricultural income in Waller County and about 15 percent in Austin County. However, many areas of prime farmland are presently used for range, pasture, or hay and further contribute to the agricultural production of the survey area.

A recent trend in land use in some parts of the survey area has been the loss of some prime farmland to urban and industrial uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, more droughty, and more difficult to cultivate and are usually less productive.

The following soils are prime farmland in Austin and Waller Counties. This list does not constitute a land-use recommendation. The extent of each listed mapping unit is shown in table 4. The locations of the soils are shown on the detailed soil maps. The soil qualities that affect use and management are described in the section "Detailed soil map units."

ArA	Aris fine sandy loam, 0 to 1 percent slopes
BbB	Bleiblerville clay, 1 to 3 percent slopes
BrA	Brazoria clay, 0 to 1 percent slopes
BrB	Brazoria clay, 1 to 3 percent slopes
Bs	Brazoria clay, depressional, where adequately drained
BuA	Burleson clay, 0 to 1 percent slopes
CaB	Carbengle clay loam, 1 to 3 percent slopes
CaC	Carbengle clay loam, 3 to 5 percent slopes
ChC	Chazos loamy fine sand 1 to 5 percent slopes
Cm	Clemville silt loam, occasionally flooded
CuB	Cuero loam, 1 to 3 percent slopes
CuC	Cuero loam, 3 to 5 percent slopes
FrB	Frelsburg clay, 1 to 3 percent slopes
FrC	Frelsburg clay, 3 to 5 percent slopes
HoB	Hockley fine sandy loam, 1 to 3 percent slopes
HoC	Hockley fine sandy loam, 3 to 5 percent slopes
HpC	Hockley gravelly fine sandy loam, 1 to 5 percent slopes
KaA	Katy fine sandy loam, 0 to 1 percent slopes
KaB	Katy fine sandy loam, 1 to 3 percent slopes
KlC	Klump sandy loam, 3 to 5 percent slopes
KnC	Knolle loamy fine sandy, 1 to 5 percent slopes
LaA	Lake Charles clay, 0 to 1 percent slopes
LaB	Lake Charles clay, 1 to 3 percent slopes
NoA	Norwood silt loam, 0 to 1 percent slopes
NrA	Norwood silty clay loam, 0 to 1 percent slopes
OkA	Oklared very fine sandy loam, 0 to 1 percent slopes
RaA	Rader fine sandy loam, 0 to 1 percent slopes
RaB	Rader fine sandy loam, 1 to 3 percent slopes
SgC	Segno fine sandy loam, 1 to 5 percent slopes
SlC	Silawa loamy fine sand, 1 to 5 percent slopes
SpB	Splendora fine sandy loam, 0 to 3 percent slopes
SrC	Straber loamy fine sand, 1 to 5 percent slopes
Wa	Waller loam, depressional, where adequately drained
WoA	Wockley fine sandy loam, 0 to 1 percent slopes
WoB	Wockley fine sandy loam, 1 to 3 percent slopes

use and management of the soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

crops and pasture

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed soil map units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

About 213,000 acres is used for crops, which is approximately 28 percent of the survey area (*6*). Waller County has about 113,000 acres in crops, and Austin County has about 100,000 acres. The major crops are rice, corn, peanuts, grain sorghum, forage sorghum, soybeans, watermelons, and truck crops. Other crops are cotton, sunflowers, guar, and castorbean. About 63,000 acres is irrigated and is used mostly for rice.

About 277,000 acres, or 37 percent of the area, is pasture. Austin County has 173,000 acres and Waller County has 104,000 acres. The pasture is mostly improved bermudagrass, bahiagrass, and kleingrass.

This soil survey area has good potential for increasing food production. Of 555,000 acres of potential cropland, 213,000 acres is currently cropped. The rest is used for pasture, range, woodland, and other uses. In addition to the reserve productive capacity represented by this land, food production could also be increased considerably by extending the lastest technology to all cropland in the survey area. This soil survey can facilitate the application of such technology.

In 1967 the survey area had about 10,000 acres of built-up land. This acreage has been slowly increasing each year, mainly because of the area's proximity to Houston. Many subdivisions have been developed or are planned. Urban converison reduces the acreage available for crops and pasture. This soil survey can help in making land use decisions.

Soil erosion is the major concern on cropland in Austin and Waller Counties. Water erosion occurs mainly on soils having slopes of more than 2 percent. There is a hazard of erosion on some of the Hockley, Frelsburg, Straber, Cuero, and Crockett soils, for example, that have slopes of more than 2 percent.

Loss of the surface layer to erosion is damaging for two reasons. First, productivity is reduced as the surface layer is lost and part of the subsoil is incorporated into the plow layer. Loss of the surface layer is especially damaging on soils that have a clayey subsoil, such as the Axtell, Crockett, and Mabank soils, and on soils that have bedrock below, such as Carbengle soils. In many

sloping fields, tilling or preparing a good seedbed is difficult on clayey or hardpan spots from which the original friable surface soil has been eroded away. Second, soil eroded from farmland becomes sediment in streams. Control of erosion minimizes the pollution of streams by sediment and improves the quality of water for municipal, recreational, and wildlife uses.

Erosion control practices provide protective surface cover, reduce runoff, and increase infiltration. A cropping system that keeps vegetation on the soil for extended periods can hold soil erosion losses to amounts that will not reduce the productive capacity of the soils. On livestock farms, which require pasture and hay, the legume and grass forage crops in the cropping system reduce erosion on sloping land and provide nitrogen and improve tilth for the following crop.

Minimizing tillage and leaving crop residue on the soil surface increase infiltration and reduce runoff and erosion. Keeping residue on the surface also reduces crusting, reduces packing by rain and farm machinery, reduces evaporation of soil moisture, and adds organic matter to the soil. In addition, it shades the soil and reduces soil temperature. Minimum tillage for corn and soybeans, which is becoming more common, is effective in reducing erosion on sloping land and can be adapted to most soils in the survey area.

Terraces and diversions reduce the length of slope, reduce runoff, and reduce erosion. They are most practical on deep, well drained soils having regular slopes.

Wind erosion is not a major problem in this survey area but is possible if extensive areas of sandy soils, such as Kenney, Monaville, Styx, and Kuy soils, are cultivated. Maintaining plant cover, surface mulch, or a rough surface through tillage minimizes wind erosion.

Wetness is of major concern on most soils having slopes of less than one percent. Wetness can delay planting or reduce production in some years. Brazoria, Edna, Katy, Lake Charles, Midland, and Waller soils have wetness problems.

Drainage is needed in many wet areas used for pasture or crops. In many areas water stands for long periods in winter and spring or during wet years. Only areas with good outlets can be drained.

Information on the design of erosion control practices and drainage systems for each kind of soil is available from local offices of the Soil Conservation Service.

Soil fertility is naturally low to medium in most upland soils in the survey area. Nitrogen, phosphorus, and potassium are needed on most sandy and loamy soils, and some sandy and loamy soils require lime. Clay loam and clay soils usually require only nitrogen and phosphorus. The soils on flood plains, such as Bosque, Nahatche, and Trinity soils, are naturally higher in plant nutrients than most upland soils. For all soils, additions of lime and fertilizer should be based on the results of soil tests, on the needs of the crop, and on the expected level of yields. The Cooperative Extension Service can help in determining the kinds and amount of fertilizer and lime to apply.

Soil tilth is an important factor affecting the germination of seeds and infiltration of water into the soil. Soils that have good tilth are granular and porous. Brazoria, Bleiblerville, and Lake Charles soils can readily develop poor tilth because they are clayey and commonly are wet in spring. If they are plowed when wet, they tend to become very cloddy on drying. Then a good seedbed is difficult to prepare. Fall plowing on such wet, clayey soils generally results in better tilth in spring.

Special crops grown commercially in the survey area include watermelons, cantaloups, sweet corn, and tomatoes. In addition, many soils are suitable for other special crops such as blackberries and grapes. Pecan trees grow well on most bottomland soils. Peach trees will grow in the survey area but are best suited to Dutek, Kenney, Silawa, and Styx soils.

Latest information and suggestions for growing special crops can be obtained from local offices of the Cooperative Extension Service and the Soil Conservation Service.

Pasture is very important in the survey area because raising livestock is the main farm enterprise. The trend has been to convert land from other uses to pasture and hay. Land used for pasture and hay generally is planted to introduced grasses that respond to good management. These grasses are used mainly to provide year-round grazing in combination with native range and supplemental pasture.

Among the important grasses are coastal bermudagrass, bahiagrass, kleingrass, weeping lovegrass, johnsongrass, indiangrass, switchgrass, and little bluestem. Coastal bermudagrass and bahiagrass are suited to most soils in the survey area. Kleingrass is suited to clayey and loamy soils. Weeping lovegrass is best suited to sandy upland soils. Johnsongrass, indiangrass, switchgrass, and little bluestem are often managed as native meadow for hay. Vetch, alfalfa, and clover are also grown for forage. At times, seed is harvested from bahiagrass, kleingrass, and clover for sale.

Good management for pasture includes fertilization, maintenance of proper grazing heights of plants, rotation of grazing, weed and brush management, and maintainance of adequate livestock water supply. Good management for hay includes fertilizing and cutting the forage at the proper height and proper stage of growth.

yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be

higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils.

land capability classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have slight limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

rangeland

Larry Butler, biologist, Soil Conservation Service, helped to prepare this section.

Range supports a wide variety of grasses, grasslike plants, forbs, shrubs, and trees. Most plants on range are generally suitable for grazing and are found in sufficient amounts to justify grazing. Rangeland or native grassland receives no regular or frequent cultural treatment. The composition and production of the plant community is determined by soil, climate, topography, overstory canopy, and grazing management.

About 73,000 acres in the survey area is range—53,000 acres in Austin County and 20,000 acres in Waller County (*6*). There are no large areas of range

today because most of the open prairie has been divided and some areas are in other uses. However, most farms contain some range. Originally, about two-thirds of the survey area was open treeless prairie and produced mostly tall and mid grasses with an abundance of forbs. The other third of the area was savannah of tall grasses, forbs, and scattered post oak.

Range in Austin and Waller Counties has changed drastically over the past century. Overuse has caused the deterioration of most grassland to the point that much of the higher quality vegetation has been grazed out. In its place is a mixture of short and mid grasses and forbs of poor quality. Now only in a few places do tall, high-quality grasses flourish.

Remnants of the original plant species still grow in protected areas on most grasslands. Some native meadows and grasslands are managed to maintain the native species. In most cases, good grazing management will allow these high-quality plants to reestablish themselves.

Most of the local ranches and livestock farms are cow-calf operations. Some ranches winter stockers, providing greater flexibility in adjusting livestock numbers during periods of drought. Many horses are raised in the survey area, most for pleasure riding, racing, and showing. Only a few are raised for ranch work.

Most livestock operations supplement native grassland with improved pasture and forage produced on cropland. Common and improved bermudagrass, bahiagrass, kleingrass, and weeping lovegrass are commonly used in pasture. Through winter, livestock feed on protein supplements, hay, and standing small grains.

Range produces forage primarily from April through October. Approximately 60 percent of the annual growth is produced in April, May, and June, when spring rains and moderate temperatures are favorable. A second growth period usually occurs during the fall rains and gradually cooling temperatures of September and October.

Extended droughts (rainfall less than three-fourths of normal) occur once every 5 years. Short dry periods are common in midsummer.

Table 6 shows, for each soil in range, the range site and the total annual production of vegetation in favorable, average, and unfavorable years. Only those soils that are used as or are suited to rangeland are listed. Explanation of the column headings in table 6 follows.

A *range site* is a distinctive kind of rangeland that produces a characteristic natural plant community that differs from natural plant communities on other range sites in kind, amount, and proportion of range plants. The relationship between soils and vegetation was established during this survey; thus, range sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important.

Potential annual production is the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, average, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In an average year, growing conditions are about normal. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Range management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range condition.

Range condition expresses the kind and amount of vegetation present in relation to the climax plant community for that site. Condition is judged according to standards that apply to the particular range site. The more closely the existing community resembles the potential (climax) community, the better the range condition. Range condition is an ecological rating only. It does not have a specific meaning that pertains to the present plant community in a given use.

Four range condition classes indicate the degree of departure from the potential vegetation brought about by grazing or other use. The classes show the present condition of the native vegetation on a range site in relation to what could grow there. Range is in excellent condition if 76 to 100 percent of the vegetation is of the same kind as that in the climax community; good condition if 51 to 75 percent; fair condition if 26 to 50 percent; and poor condition if 25 percent or less.

Potential forage production depends on the range site. Current forage production depends on the range condition and the amount of moisture available to plants during the growing season.

A primary objective of good range management is keeping range in excellent or good condition, thereby conserving water, improving yields, and protecting the soils. The main management concern is recognizing important changes in the cover on a range site. These changes take place gradually and can be misinterpreted or overlooked. Growth encouraged by heavy rainfall may make the range appear to be in good condition, when actually the cover is weedy and the long-term trend is toward lower production. On the other hand some kinds of range, when closely grazed for short periods under the supervision of a careful manager, can have a

degraded appearance that temporarily conceals its quality and ability to recover.

Prolonged overuse of range will eliminate seed sources of desirable plants. In such instances the climax community must be reestablished by brush control, range seeding, fencing, water development, and other forms of treatment. Thereafter, deferred grazing, proper grazing, and planned grazing systems are needed to maintain and improve the range.

Good management generally results in optimum production of vegetation, conservation of water, and control of erosion. Sometimes a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

range sites

Soils vary in their capacity to produce grasses and other plants for grazing. Soils that produce about the same kinds, amounts, and proportions of forage plants make up a range site.

The climax vegetation of a range site is the stabilized plant community—what the site is capable of producing. The climax vegetation will reproduce itself and will change very little as long as the environment remains unchanged. Throughout the prairie, the climax vegetation consists of the plants that were growing there when the region was first settled. If cultivated crops are not grown, the most productive combination of forage plants on a range site is generally the climax vegetation.

Some plants in the climax community tend to decrease in relative amount under heavy grazing. These generally are the tallest and most productive grasses and forbs and are the most palatable to livestock. Other plants in the climax vegetation increase in proportion as the more desirable plants are reduced by heavy grazing. They are commonly shorter than decreasers and are generally less palatable to livestock. Invaders are plants that cannot normally compete with the climax vegetation for moisture, nutrients, and light. Hence, invaders come in and grow along with the increasers after the climax vegetation has been deteriorated by grazing. Some invaders offer good grazing, but others have little value for grazing.

There are 18 range sites in the survey area. The following descriptions give, for each site, the climax community and the changes to be expected if the site is overgrazed.

Blackland (Blackland Prairie) range site

Bleiblerville, Burleson, Frelsburg, and Lake Charles soils are in this range site. The climax plant community is tall grass prairie and is about 90 percent grasses, 5 percent woody plants, and 5 percent forbs.

About 75 percent of the climax community is little bluestem, indiangrass, and big bluestem. The rest is eastern gamagrass, switchgrass, Virginia wildrye, Florida paspalum, sideoats grama, silver bluestem, Texas wintergrass, Texas cupgrass, vine-mesquite, low panicums, white tridens, sedges, and buffalograss; a wide variety of forbs including Maximilian sunflower, Engelmann-daisy, blacksamson, penstemon, dotted gayfeather, bundleflower, sensitivebrier, yellow neptunia, prairie-clover, snoutbean, wildbean, tickclover, western indigo, paintbrush, bluebonnet, ragweed, croton, and milkweed; and scattered mottes of live oak, elm, hackberry, bumelia, and coralberry.

Under heavy use the tall grasses are grazed out and are replaced by silver bluestem, Texas wintergrass, sideoats grama, and tall dropseed. If overuse continues, these are grazed out and are replaced by mesquite, winged elm, honeylocust, huisache, osageorange, Texas grama, broomweed, and a host of annual grasses and forbs.

Blackland (Coast Prairie) range site

Lake Charles and Midland soils are in this range site. The climax plant community is tall grass prairie and is about 95 percent grasses and 5 percent forbs.

About 75 percent of the climax community is little bluestem, indiangrass, eastern gamagrass, switchgrass, and big bluestem. Other grasses include vaseygrass and Florida paspalum. The rest of the plant community is forbs such as Maximilian sunflower, gayfeather, prairie-clover, sensitivebrier, and blackeyed Susan.

Under heavy use the tall grasses such as indiangrass, eastern gamagrass, and big bluestem decrease and are replaced by silver bluestem, knotroot bristlegrass, and a higher proportion of little bluestem. As these are grazed out, they are replaced by broomsedge bluestem, smutgrass, brownseed paspalum, annual weeds and grasses, and woody plants such as eastern baccharis, sesbania, mesquite, and huisache.

Chalky Ridge range site

Renish soils are in this range site. The climax plant community is true prairie with occasional mottes of live oak. The composition is 85 percent grasses, 5 percent woody plants, and 10 percent forbs.

About 80 percent of the climax community is little bluestem, indiangrass, sideoats grama, silver bluestem, and tall dropseed. Other grasses include Virginia and Canada wildryes, Texas wintergrass, threeawn, low panicums, and buffalograss. Forbs include Maximilian sunflower, Engelmann-daisy, gayfeather, bundleflower, sensitivebrier, yellow neptunia, prairie-clover, snoutbean, vetch, ragweed, bluebonnet, paintbrush, verbenas, winecup, and croton. Woody plants include live oak, hackberry, elm, bumelia, and coralberry.

Under heavy use little bluestem and indiangrass decrease and are replaced by sideoats grama, Texas

wintergrass, silver bluestem, buffalograss, and threeawns. If heavy use continues, these are grazed out and are replaced by hairy grama, Texas grama, threeaws, broomweed, pricklypear, Texas wintergrass, and a host of annual weeds and forbs.

Clay Loam range site

Brenham, Carbengle, and Cuero soils are in this range site. The climax plant community is tall prairie grasses with some woody plants along drainageways. The composition is about 90 percent grasses, 5 percent forbs, and 5 percent woody plants.

About 70 percent of the climax community is little bluestem, indiangrass, switchgrass, and big bluestem. Other grasses include Florida paspalum, Canada wildrye, sideoats grama, silver bluestem, tall dropseed, Texas wintergrass, and buffalograss. Forbs include Maximilian sunflower, Engelmann-daisy, blacksamson, bundleflower, sensitivebrier, yellow neptunia, prairie-clover, snoutbean, tickclover, partridgepea, and vetch. Woody vegetation includes hackberry, elm, and pecan mostly along drainageways with widely scattered live oak on the uplands.

Under heavy use, big bluestem is grazed out first, followed by indiangrass, switchgrass, and little bluestem. At the same time, sideoats grama, silver bluestem, Texas wintergrass, tall dropseed, and low panicums increase initially. These plants then decrease as overuse continues. Eventually, the vegetation consists mainly of buffalograss, Texas grama, western ragweed, nightshades, threeawns, milkweed, and mesquite.

Clayey Bottomland range site

Brazoria, Sumpf, and Trinity soils are in this range site. The climax vegetation is savannah and is about 75 percent grasses, 20 percent woody plants, and 5 percent forbs.

About 60 percent of the climax community is Virginia and Canada wildryes, sedges, switchgrass, indiangrass, little bluestem, big bluestem, eastern gamagrass, vine-mesquite, Florida paspalum, and panicums. Woody plants include elm, cottonwood, hackberry, pecan, willow, and oak. Forbs include tickclover, snoutbean, lespedezas, blood ragweed, and ironweed.

If the site is overgrazed, trees and shrubs increase to form a dense canopy, and shade-sensitive prairie grasses decrease. If heavy use continues, tall grasses are grazed out and are replaced by broomsedge bluestem, smutgrass, carpetgrass, bermudagrass, buffalograss, cocklebur, ragweed, annual grasses, and forbs.

Claypan Prairie range site

Crockett, Edna, Mabank, and Wilson soils are in this range site. The climax plant community is prairie or very open savannah and is about 85 percent grasses, 10 percent forbs, and 5 percent woody plants.

About 65 percent of the climax community is little bluestem and indiangrass. Other grasses include switchgrass, big bluestem, Virginia and Canada wildryes, Florida paspalum, sideoats grama, meadow dropseed, Texas wintergrass, vine-mesquite, purpletop, brownseed paspalum, buffalograss, low panicums, and sedges. Forbs include Maximilian sunflower, Engelmann-daisy, halfshrub sundrop, blacksamson, sensitivebrier, yellow neptunia, bundleflower, vetch, snoutbean, Indian paintbrush, milkweed, and western ragweed. Woody plants include oak, elm, hackberry, and coralberry.

Under heavy use big and little bluestem, indiangrass, and switchgrass decrease and are replaced by silver bluestem, meadow dropseed, Texas wintergrass, and sideoats grama. If heavy use continues, these plants are grazed out and are replaced by mesquite, buffalograss, Texas grama, pricklypear, Texas wintergrass, windmillgrass, and weedy forbs. Some areas have been invaded by post oak, yaupon, greenbrier, and other woody plants.

Claypan Savannah range site

Axtell and Lufkin soils are in this range site. The climax plant community is a savannah of post oak and blackjack oak. It is about 75 percent grasses, 20 percent woody plants, and 5 percent forbs.

About 60 percent of the climax community is little bluestem, indiangrass, and brownseed paspalum. Other grasses include switchgrass, Florida paspalum, purpletop, low panicums, threeawns, sideoats grama, silver bluestem, Texas wintergrass, and sedges. Woody plants include post oak, blackjack oak, hackberry, elm, hawthorn, yaupon, and other woody shrubs. Forbs include bundleflower, lespedezas, sensitivebrier, tickclover, yellow neptunia, snoutbean, vetch, Engelmann-daisy, western ragweed, and croton.

Under heavy use, little bluestem and indiangrass are grazed out and brownseed paspalum, silver bluestem, splitbeard bluestem, Texas wintergrass, and low panicums increase. If heavy use continues, oak, elm, yaupon, hawthorn, American beautyberry, eastern redcedar, greenbrier, and berry vines increase to form a dense canopy. More open areas are likely to contain broomsedge bluestem, smutgrass, red lovegrass, Texas wintergrass, carpetgrass, and a host of annual grasses and forbs.

Deep Sand range site

Eufaula and Kuy soils are in this range site. The climax plant community is prairie and is about 85 percent grasses, 10 percent woody plants, and 5 percent forbs.

About 75 percent of the climax community is little bluestem, indiangrass, and crinkleawn. Other grasses

include switchgrass, big bluestem, brownseed paspalum, gulf muhly, slimspike tridens, and Florida paspalum. Forbs include snoutbean, partridgepea, prairie-clover, croton, bullnettle, and yankeeweed. Woody vegetation is mostly mottes of post oak, live oak, yaupon, and other shrubs.

Under heavy use little bluestem, indiangrass, big bluestem, and switchgrass are grazed out and brownseed paspalum, gulf muhly, and broomsedge bluestem increase. If heavy use continues, these plants are grazed out and are replaced by yaupon, bullnettle, yankeeweed, and a host of annual weeds and grasses.

Deep Sand Savannah range site

Catilla soils are in this range site. The climax plant community is savannah and is about 75 percent grasses, 20 percent woody plants, and 5 percent forbs.

About 60 percent of the climax community is little bluestem and indiangrass. Other grasses include switchgrass, sand lovegrass, crinkleawn, purpletop, brownseed paspalum, silver bluestem, broomsedge bluestem, and low panicums. Woody plants include post oak, blackjack oak, water oak, hickory, American beautyberry, yaupon, greenbrier, berry vines, grape, and elm. Forbs include lespedezas, sensitivebrier, western indigo, partridgepea, croton, bullnettle, and yankeeweed.

Under heavy use little bluestem, indiangrass, and switchgrass are grazed out and post oak, blackjack oak, elm, hickory, ash, American beautyberry, and other woody plants increase. Where the range is in deteriorated condition, the vegetation is mainly trees with open areas of broomsedge bluestem, brownseed paspalum, bullnettle, croton, yankeeweed, queensdelight, pricklypear, sandbur, and a host of annual grasses and forbs.

Eroded Blackland range site

Latium soils are in this range site. The potential climax plant community is tall-grass prairie and is about 85 percent grasses, 10 percent forbs, and 5 percent woody plants. The climax vegetation has been destroyed by cultivation or erosion; hence the site will be less productive.

About 75 percent of the climax community is little bluestem, indiangrass, and big bluestem. Other grasses include Virginia and Canada wildryes, switchgrass, Florida paspalum, sideoats grama, tall dropseed, silver bluestem, Texas wintergrass, and low panicums. Forbs include Maximilian sunflower, Engelmann-daisy, blacksamson, gayfeather, bundleflower, sensitivebrier, vetch, paintbrush, bluebonnet, ragweeds, winecup, bluebells, milkweed, and croton. Woody vegetation is scattered mottes of live oak, hackberry, elm, and bumelia.

Under heavy use little bluestem, big bluestem, and indiangrass are grazed out and are replaced by silver bluestem, Texas wintergrass, and sideoats grama. If overuse continues, these plants are replaced by mesquite, winged elm, Texas grama, broomweed, and a host of annual grasses and forbs.

Loamy Bottomland range site

Bosque, Clemville, Nahatche, Norwood, and Oklared soils are in this range site. The climax plant community is savannah and is about 75 percent grasses, 20 percent woody plants, and 5 percent forbs.

About 50 percent of the climax community is Virginia wildrye, sedges, switchgrass, indiangrass, big bluestem, little bluestem, eastern gamagrass, plumegrass, vine-mesquite, and purpletop. Other grasses include brownseed paspalum, Carolina jointtail, tall dropseed, buffalograss, and Texas wintergrass. Woody plants include oak, pecan, hackberry, elm, cottonwood, willow, sycamore, ash, and woody vines. Forbs include tickclover, lespedeza, snoutbean, partridgepea, blood ragweed, and ironweed.

Under heavy use, the taller grasses are grazed out and woody trees, shrubs, and vines increase to form a dense canopy. If heavy use continues, the woody canopy thickens but open areas contain broomsedge bluestem, bermudagrass, vaseygrass, cocklebur, sunflower, ragweed, and a host of annual grasses and forbs.

Loamy Prairie range site

Aris, Hockley, Katy, Waller, and Wockley soils are in this range site. The climax plant community is true prairie and is about 95 percent grasses and 5 percent forbs.

About 80 percent of the climax community is little bluestem, indiangrass, switchgrass, and eastern gamagrass. Other grasses include Florida paspalum, brownseed paspalum, vaseygrass, fall witchgrass, gulf muhly, and sedges. Forbs include Maximilian sunflower, buttonsnakeroot, gayfeather, sensitivebriar, yellow neptunia, bundleflower, ragweed, and prairie-clover.

Under heavy use little bluestem, indiangrass, switchgrass, and eastern gamagrass are grazed out and are replaced by brownseed paspalum, vaseygrass, longspike tridens, fall witchgrass, gulf muhly, and knotroot bristlegrass. If heavy use continues, these plants are grazed out and are replaced by broomsedge bluestem, windmillgrass, vaseygrass, smutgrass, carpetgrass, yankeeweed, broomweed, wildindigo, and a host of annual grasses and weeds.

Loamy Sand range site

Chazos, Silawa, and Straber soils are in this range site. The climax plant community is open savannah and is about 75 percent grasses, 20 percent woody plants, and 5 percent forbs.

About 60 percent of the climax community is little bluestem and indiangrass. Other grasses include switchgrass, low panicums, purpletop, sand lovegrass, Florida paspulum, low paspalums, silver bluestem, splitbeard bluestem, brownseed paspalum, and sedges. Woody plants include post oak, blackjack oak, water oak, hickory, American beautyberry, greenbriar, berry vines, yaupon, and grape. Forbs include spiderwort, dayflower, lespedezas, tickclover, sensitivebrier, snoutbean, western indigo, partridgepea, goldenrod, and yankeeweed.

Under heavy use, little bluestem and indiangrass are grazed out and are replaced by red lovegrass, yankeeweed, broomsedge bluestem, smutgrass, pricklypear, annual grasses, and forbs. If heavy use continues, these plants are grazed out and oak, yaupon, hawthorn, greenbrier, American beautyberry, and berry vines form dense thickets in some places.

Lowland range site

Depressional Midland soils are in this range site. The climax plant community is wet prairie and is about 95 percent grasses and sedges and 5 percent forbs.

About 20 percent of the climax community is switchgrass, 20 percent is maidencane, 15 percent is eastern gamagrass, and 20 percent is sedges. The rest of the plant community is forbs such as Maximilian sunflower, sumpweed, and smartweed.

Under heavy use, maidencane and eastern gamagrass decrease and are replaced by longtom, brownseed paspalum, broomsedge bluestem, and bushy bluestem. If heavy grazing continues, soft rush, carpetgrass, bitter sneezeweed, sesbania, smartweed, and other sedges and rushes invade.

Sandy range site

Dutek, Newulm, Styx, and Tremona soils are in this range site. The climax vegetation is open savannah of post oak and blackjack oak which shade about 25 percent of the ground. The composition is about 75 percent grasses, 20 percent woody plants, and 5 percent forbs.

About 60 percent of the climax community is little bluestem and indiangrass. Other grasses include switchgrass, beaked panicum, sand lovegrass, crinkleawn, purpletop, brownseed paspalum, purple lovegrass, splitbeard bluestem, and low panicums. Woody species include post oak, blackjack oak, hawthorn, elm, American beautyberry, greenbrier, yaupon, and grape. Forbs include lespedezas, tickclover, sensitivebrier, snoutbean, wildbean, western indigo, partridgepea, and yankeeweed.

Under heavy use, little bluestem and indiangrass are grazed out and are replaced by sand lovegrass, crinkleawn, brownseed paspalum, broomsedge, splitbeard bluestem, smutgrass, and low panicums. If heavy use continues, oak, greenbrier, yaupon, berry vines, red lovegrass, yankeeweed, bullnettle, croton, broomsedge, bluestem, sandbur, pricklypear, queensdelight, smutgrass, and a host of annual grasses and weeds increase.

Sandy Loam range site

Klump, Knolle, Rader, Segno, and Tabor soils are in this range site. The climax plant community is a savannah of post oak and blackjack oak. The composition is about 75 percent grasses, 20 percent woody plants, and 5 percent forbs.

About 60 percent of the climax community is little bluestem and indiangrass. Other grasses include beaked panicum, switchgrass, big bluestem, eastern gamagrass, longleaf uniola, brownseed paspalum, low paspalums, low panicums, silver bluestem, and sedges. Woody plants include post oak, blackjack oak, red oak, hackberry, elm, hawthorn, yaupon, American beautyberry, greenbrier, grape, and berry vines. Forbs include Engelmann-daisy, gayfeather, sensitivebrier, lespedezas, tickclover, wildbean, snoutbean, partridgepea, ragweed, paintbrush, and evening primrose.

Under heavy use little bluestem, indiangrass, eastern gamagrass, and switchgrass are grazed out and are replaced by silver bluestem, broomsedge bluestem, brownseed paspalum, carpetgrass, and bermudagrass. If heavy use continues, oak, elm, hickory, hawthorn, American beautyberry, eastern redcedar, persimmon, yaupon, greenbrier, and berry vines increase until the site resembles a scrub forest.

Sandy Prairie range site

Kenney and Monaville soils are in this range site. The climax vegetation is true prairie and is about 95 percent grasses and 5 percent forbs.

About 75 percent of the climax community is little bluestem, indiangrass, and crinkleawn. Other grasses include switchgrass, big bluestem, Florida paspalum, gulfdune paspalum, brownseed paspalum, gulf muhly, and low panicums. Forbs include snoutbean, partridgepea, prairie-clover, spiderwort, dayflower, croton, yankeeweed, and bullnettle.

Under heavy use little bluestem, indiangrass, crinkleawn, switchgrass, and big bluestem are grazed out and are replaced by brownseed paspalum. If heavy use continues, these plants are replaced by smutgrass, red lovegrass, yankeeweed, bullnettle, and a host of annual grasses and weeds.

Wet Sandy Draw range site

Sealy soils are in this range site. The climax plant community is prairie and is about 90 percent grasses, 5 percent woody plants, and 5 percent forbs.

About 70 percent of the climax community is sugar plumegrass, vaseygrass, maidencane, switchgrass, little bluestem, indiangrass, and big bluestem. Other grasses include sedges, broomsedge bluestem, arrowfeather threeawn, rushes, Scribner panicum, and low panicums. Forbs include aster, goldenrod, smartweed, tickleaf sunflower, ironweed, and stiffhair sunflower. Woody plants include yaupon, waxmyrtle, berry vines, greenbrier, honeysuckle, sweetgum, and willow.

Under heavy use sugar plumegrass, little bluestem, indiangrass, big bluestem, and switchgrass are grazed out and are replaced by maidencane, sedges, broomsedge bluestem, and arrowfeather threeawn. If heavy use continues, woody plants such as yaupon, waxmyrtle, berry vines, greenbrier, and honeysuckle increase to form a dense canopy.

woodland management and productivity

Approximately 60,000 acres in the survey area is woodland. Most of this acreage is in the eastern part of Waller County. Bottomland hardwoods and oak-hickory forest occupy most of the acreage. About 30 percent of the woodland supports loblolly-shortleaf pine forest. Most of the survey area was originally hardwood forest and prairie, but pine forest has encroached in the last 150 years and now forms many stands of merchantable timber.

Other parts of the survey area could produce timber. These areas are mainly Katy, Monaville, Wockley, and Kenney soils.

The woodland is generally well managed. Severe insect and disease attacks are cyclic. Ice damage is rare. Many stands support inferior hardwoods that should be removed to improve production.

Pine will grow in most of the area, and many areas have adequate stands. However, much of the forest supports less growing stock than it could, and production is below potential.

All of the woodland is privately owned. About 10 percent is owned by large forest industries. In recent years, many acres of woodland have been converted to urban uses. Pine production is decreasing, mainly because of the loss of land to housing.

Table 7 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: x, w, t, d, c, s, f, and r.

In table 7, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *plant competition* indicate the degree to which undesirable plants are expected to invade where there are openings in the tree canopy. The invading plants compete with native plants or planted seedlings. A rating of *slight* indicates little or no competition from other plants; *moderate* indicates that plant competition is expected to hinder the development of a fully stocked stand of desirable trees; *severe* indicates that plant competition is expected to prevent the establishment of a desirable stand unless the site is intensively prepared, weeded, or otherwise managed to control undesirable plants.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. Site index was determined at age 30 years for eastern cottonwood, 35 years for American sycamore, and 50 years for all other species. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland

managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suited to the soils and to commercial wood production.

woodland understory vegetation

Understory vegetation consists of grasses, forbs, shrubs, and other plants. Some woodland, if well managed, can produce enough understory vegetation to support grazing of livestock or wildlife, or both, without damage to the trees.

The quantity and quality of understory vegetation vary with the kind of soil, the age and kind of trees in the canopy, the density of the canopy, and the depth and condition of the litter. The density of the canopy determines the amount of light that understory plants receive.

Table 8 shows, for each soil suitable for woodland grazing, the potential for producing understory vegetation. The total production of understory vegetation includes the herbaceous plants and the leaves, twigs, and fruit of woody plants up to a height of 4 1/2 feet. It is expressed in pounds per acre of air-dry vegetation in favorable, normal, and unfavorable years. In a favorable year, soil moisture is above average during the optimum part of the growing season; in a normal year, soil moisture is average; and in an unfavorable year, it is below average.

Table 8 also lists the common names of the characteristic vegetation on each soil and the percentage composition, by air-dry weight, of each kind of plant. The table shows the kind and percentage of understory plants expected under a canopy density that is most nearly typical of woodland in which the production of wood crops is highest.

recreation

The soils of the survey area are rated in table 9 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 9, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 9 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 12 and interpretations for dwellings without basements and for local roads and streets in table 11.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

wildlife habitat

Larry Butler, biologist, Soil Conservation Service, helped to prepare this section.

Wildlife in Austin and Waller Counties includes bobwhite, mourning dove, rabbit, squirrel, armadillo, numerous songbirds, herons, egrets, and raptors. White-tailed deer are found in the western and northern parts of the survey area and along the Brazos River. Ducks and geese winter in the southern part of the area and feed on grain fields. The most common furbearers are raccoon, coyote, fox, bobcat, opossum, and skunk. A few beaver and mink are found along drainageways.

Hardwood trees and shrubs along streams and draws and on hillsides provide food, nesting and roosting sites, travel lanes, and escape cover for wildlife in the northern and western part of the survey area. The northeastern part of Waller County has thick stands of pine and hardwoods that also provide adequate cover for wildlife. Marsh areas and open water in the prairie along the southern and eastern parts of the survey area provide suitable habitat for geese and ducks.

Fish are found in the Brazos River, perennial streams, private lakes, and farm ponds. Most are warm-water species such as black bass, channel catfish, sunfish, crappie, white bass, carp, and gar.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 10, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, sorghum, and rice.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, bahiagrass, kleingrass, lovegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, and grama.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, poplar, sweetgum, hawthorn, dogwood, hickory, blackberry, bois-d'arc, pecan, sassafras, sumac, hackberry, elm, grape, and brier. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple.

Coniferous plants furnish browse, seeds, and cones. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, cedar, and juniper.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are honeysuckle, yaupon, American beautyberry, and berry vines.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil

properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, saltgrass, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite, quail, pheasant, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, shore birds, mink, and beaver.

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland include deer, bobwhite, dove, and songbirds.

engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

building site development

Table 11 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that

special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

sanitary facilities

Table 12 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 12 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 12 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 12 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

construction materials

Table 13 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 13, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

water management

Table 14 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks

are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 18.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

engineering index properties

Table 15 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and their morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains particles coarser than sand, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 18.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

physical and chemical properties

Table 16 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year (*8*). The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 16, the estimated content of organic matter of the plow layer is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

soil and water features

Table 17 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes are not considered flooding.

Table 17 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 17 are the depth to the seasonal high water table; the kind of water table—that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 17.

An apparent water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An artesian water table is under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A perched water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil

boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

engineering index test data

Table 18 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. Most of the pedons are typical of the series and are described in the section "Soil series and their morphology." The soil samples were tested by Texas State Department of Highways and Public Transportation.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) (*1*) or the American Society for Testing and Materials (ASTM) (*2*).

The tests and methods are—AASHTO classification—M 145 (AASHTO), D 3282 (ASTM); Unified classification—D 2487 (ASTM); Mechanical analysis—T 88 (AASHTO), D 2217 (ASTM), except that for material larger than 3/8 inch, square mesh wire sieves were used that are slightly larger than the equivalent round sieves but which do not seriously affect the data; Liquid limit—T 89 (AASHTO), D 423 (ASTM); Plasticity index—T 90 (AASHTO), D 424 (ASTM); Specific gravity (particle index)—T 100 (AASHTO), D 653 (ASTM); Shrinkage—T 92 (AASHTO), D 427 (ASTM). In determining liquid limit and plasticity index values, the indicated methods were used except that the soil was added to the water.

classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*9*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 19, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Entisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquent (*Aqu*, meaning water, plus *ent*, from Entisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haplaquents (*Hapl*, meaning minimal horizonation, plus *aquent*, the suborder of the Entisols that have an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Haplaquents.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, nonacid, mesic Typic Haplaquents.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

soil series and their morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*7*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*9*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed soil map units."

Annona series

The Annona series consists of deep, somewhat poorly drained, loamy soils on ancient stream terraces. They formed in stratified clayey and loamy marine sediment. Slope ranges from 0 to 5 percent.

Typical pedon of Annona fine sandy loam, 1 to 5 percent slopes, in northeast part of Waller County; from the intersection of Farm Road 1488 and Rice Road, 1.6 mile south on Rice Road to intersection with Wigwam Trail, 0.2 mile north on Wigwam Trail, 75 feet east of road along powerline right-of-way in rangeland:

Ap—0 to 8 inches; pale brown (10YR 6/3) fine sandy loam, very pale brown (10YR 7/3) dry; weak fine subangular blocky structure; hard, friable; common roots; few siliceous pebbles; few fine ironstone nodules; strongly acid; abrupt wavy boundary.

B21t—8 to 28 inches; yellowish red (5YR 5/6) clay, yellowish red (5YR 5/6) dry; distinct grayish brown (10YR 5/2) and red (2.5YR 4/6) mottles; moderate medium blocky structure; extremely hard, very firm; few roots; common pressure faces; few patchy clay films; few siliceous pebbles; few fine black concretions; very strongly acid; gradual smooth boundary.

B22t—28 to 43 inches; dark grayish brown (2.5Y 4/2) clay, grayish brown (2.5Y 5/2) dry; medium distinct mottles of light olive brown (2.5Y 5/4); moderate medium blocky structure; extremely hard, very firm; few roots; few patchy clay films; few fine black concretions; neutral; gradual smooth boundary.

B23t—43 to 65 inches; yellowish brown (10YR 5/4) clay, light yellowish brown (10YR 6/4) dry; common medium distinct grayish brown (10YR 5/2) mottles; moderate medium blocky structure; extremely hard, extremely firm; few roots; few patchy clay films; few black concretions; few concretions of calcium carbonate; moderately alkaline; gradual smooth boundary.

C—65 to 75 inches; brown (7.5YR 5/4) clay, light brown (7.5YR 6/4) dry; many medium distinct mottles of light gray (10YR 7/2); massive; extremely hard, very firm; ped surfaces have strippings of fine sandy loam; moderately alkaline.

When dry, the soil has cracks that are 1/2 inch or more wide in the upper part of the subsoil. Fine siliceous pebbles are throughout some pedons.

The A horizon is generally less than 10 inches thick but may be as thick as 15 inches over subsoil troughs. The A1 or Ap horizon is pale brown or brown when moist. Reaction is strongly acid to slightly acid.

The B21t horizon is yellowish red and mottled in shades of grayish brown, yellowish red, red, and light yellowish brown. Texture is clay or sandy clay loam with 35 to 60 percent clay. Reaction is very strongly acid to strongly acid.

The B22t horizon is prominently and distinctly mottled in shades of very dark grayish brown, dark yellowish brown, dark grayish brown, light olive brown, strong brown, yellowish red, and grayish brown. It is 40 to 60 percent clay. Reaction is strongly acid to neutral.

The B3t and C horizons are yellowish brown, brown, light brown, or light gray. They are 40 to 55 percent clay. Reaction is slightly acid to moderately alkaline. Concretions of calcium carbonate are in some pedons.

Aris series

The Aris series consists of deep, somewhat poorly drained, loamy soils on uplands. They formed in loamy and clayey coastal plain sediment. Slope ranges from 0 to 1 percent.

Typical pedon of Aris fine sandy loam, 0 to 1 percent slopes, in southeast part of Waller County; from the junction of Farm Road 2855 and U.S. Highway 90, 3.2 miles north on Farm Road 2855, 0.3 mile west, 300 feet north of road in cropland:

Ap—0 to 16 inches; light brownish gray (10YR 6/2) fine sandy loam, light gray (10YR 7/2) dry; common faint mottles of brown (10YR 5/3); weak fine subangular blocky structure; hard, very friable; common fine roots; medium acid; clear wavy boundary.

Bg&Ag—16 to 28 inches; grayish brown (10YR 5/2) sandy clay loam, light brownish gray (10YR 6/2) dry; common distinct mottles of yellowish brown (10YR 5/6); weak fine subangular blocky structure; hard, friable; common fine roots; Ag is tongues of light gray (10YR 7/2) fine sandy loam; slightly acid; clear irregular boundary.

B21tg—28 to 38 inches; dark grayish brown (10YR 4/2) clay, dark grayish brown (10YR 4/2) dry; common medium distinct mottles of yellowish brown (10YR 5/6); weak medium blocky structure; very hard, very firm; few fine roots; few patchy clay films; thin tongues of loamy material; medium acid; common thick clay films; gradual wavy boundary.

B22tg—38 to 70 inches; light gray (10YR 7/1) clay, light gray (10YR 7/1) dry; common medium distinct mottles of yellowish brown (10YR 5/6); weak coarse blocky structure; very hard, very firm; few patchy clay films on peds; medium acid.

The solum is more than 70 inches thick.

The A horizon is 14 to 35 inches thick. The A1 horizon when moist is grayish brown or light brownish gray. Yellowish brown and brown mottles are present in some pedons. Reaction is medium acid to neutral.

The Bg&Ag horizon is gray or grayish brown with yellowish brown mottles. Texture is clay loam, sandy clay loam, sandy clay, or clay. Tongues of fine sandy loam extend into this horizon from the A horizon. Reaction is strongly acid to slightly acid.

The B21tg horizon is gray, dark gray, or dark grayish brown with yellowish brown mottles. Texture is sandy clay or clay with few thin tongues of fine sandy loam extending into it. Reaction is strongly acid to slightly acid.

The B22tg horizon is light gray or gray with yellowish brown and brown mottles. Texture is clay or sandy clay. Reaction ranges from strongly acid to slightly acid.

Aris soils in this survey are taxadjuncts to the Aris series because they have slightly higher chroma in the

upper part of the subsoil than is typical for the series. Use and management are similar.

Axtell series

The Axtell series consists of deep, moderately well drained, loamy soils on ancient stream terraces. They formed in loamy and clayey alluvium. Slope ranges from 1 to 8 percent.

Typical pedon of Axtell fine sandy loam, 1 to 5 percent slopes; from intersection of Texas Highway 6 and Texas Highway 159 in Hempstead, 7.5 miles north on Texas Highway 6, 0.3 mile east on Farm Road 2979 to Kloecker Road, 100 feet northeast of fence corner in pasture:

A1—0 to 3 inches; dark grayish brown (10YR 4/2) fine sandy loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; very hard, friable; many fine roots; few siliceous pebbles; medium acid; abrupt smooth boundary.

A2—3 to 8 inches; brown (10YR 5/3) fine sandy loam, very pale brown (10YR 7/3) dry; weak fine subangular blocky structure; very hard, friable; many fine roots; few siliceous pebbles; medium acid; abrupt wavy boundary.

B21t—8 to 22 inches; yellowish red (5YR 5/6) clay, common medium distinct light gray (10YR 7/2) mottles; moderate medium subangular blocky structure; extremely hard, very firm; few fine roots; many distinct clay films; few siliceous pebbles; very strongly acid; gradual wavy boundary.

B22t—22 to 36 inches; distinctly and coarsely mottled yellowish brown (10YR 5/6), light gray (10YR 7/2), and yellowish brown (10YR 5/4) clay; moderate medium subangular blocky structure; extremely hard, very firm, few fine roots; very strongly acid; gradual wavy boundary.

B23tg—36 to 48 inches; light brownish gray (10YR 6/2) clay, light gray (10YR 7/2) dry; common medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; extremely hard, very firm; few fine roots; many distinct clay films; medium acid; gradual wavy boundary.

B3—48 to 60 inches; light brownish gray (2.5Y 6/2) clay; common fine faint olive yellow mottles; weak medium subangular blocky structure; extremely hard, very firm; few black specks; faint thin clay films; common fine concretions of calcium carbonate; moderately alkaline.

When dry, the soil has cracks that are 1/2 inch wide at a depth of 20 inches. Fine siliceous pebbles are throughout some pedons.

The A horizon is generally less than 10 inches thick but may be as thick as 15 inches over subsoil troughs. The A1 horizon is dark grayish brown, light brownish gray, brown, pale brown, or grayish brown when moist. The A2 horizon is brown, very pale brown, light yellowish brown, or pale brown. The A horizon is slightly acid to strongly acid. The boundary between the A and Bt horizons is abrupt over subsoil crests and clear over subsoil troughs.

The B21t horizon is yellowish red or reddish brown mottled with shades of yellow, red, gray, or brown. Texture is clay, sandy clay, or clay loam with 35 to 55 percent clay. Reaction is strongly acid or very strongly acid.

The B22t horizon is prominently to distinctly mottled in shades of red, gray, and brown. It is clay or sandy clay with 40 to 60 percent clay. Reaction is strongly acid to neutral.

The B3 and C horizons are sandy clay or clay with 40 to 55 percent clay. Reaction is medium acid to moderately alkaline. Concretions and soft masses of calcium carbonate are in some pedons.

Bleiblerville series

The Bleiblerville series consists of deep, moderately well drained, clayey soils on uplands. They formed in calcareous clay and marl. Slope ranges from 1 to 3 percent.

Typical pedon of Bleiblerville clay, 1 to 3 percent slopes, west of Bellville; from courthouse in Bellville, 11 miles west on Texas Highway 159 to Farm Road 2754, 0.3 mile northeast on Farm Road 2754, 100 feet southeast of road in native meadow:

A11—0 to 18 inches; black (10YR 2/1) clay, black (10YR 2/1) dry; moderate medium subangular blocky structure; extremely hard, very firm, very sticky and very plastic; approximately 1 inch of granular mulch on surface; many fine roots; few slickensides below a depth of 10 inches; calcareous; moderately alkaline; gradual wavy boundary.

A12—18 to 32 inches; gray (10YR 5/1) clay, gray (10YR 5/1) dry; moderate medium subangular blocky structure; extremely hard, very firm, very sticky and very plastic; few fine roots; common large slickensides tilted 45 degrees from the horizontal; few concretions of calcium carbonate; common vertical streaks of black (10YR 2/1) material in old cracks; calcareous; moderately alkaline; gradual wavy boundary.

AC1—32 to 55 inches; grayish brown (10YR 5/2) clay, grayish brown (10YR 5/2) dry; common medium distinct grayish brown and yellowish brown mottles; moderate medium subangular blocky structure; extremely hard, extremely firm, very sticky and very plastic; few fine roots; common large slickensides; few concretions of calcium carbonate; few siliceous pebbles; calcareous; moderately alkaline; gradual wavy boundary.

AC2—55 to 70 inches; grayish brown (10YR 5/2) clay, grayish brown (10YR 5/2) dry; common medium distinct dark grayish brown (10YR 4/2) and yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; extremely hard, extremely firm, very sticky and very plastic; common concretions of calcium carbonate; moderately alkaline.

This soil when dry has cracks that are as much as 3 inches wide on the surface and extend in some pedons to a depth of more than 50 inches. Intersecting slickensides are common throughout the soil below a depth of 8 inches. In areas of native vegetation, these soils have a mocrorelief of microknolls 4 to 16 inches higher than microdepressions. The cycle of microdepression and microknoll is repeated each 5 to 10 feet. In the microdepressions, the soils have a darker and thicker surface layer.

The A horizon is black or very dark gray when moist. Dark colors are thickest in microdepressions and extend into lower horizons in old filled cracks.

The AC horizon is pale yellow, light gray, very pale brown, grayish brown, light yellowish brown, or gray.

The C horizon, where present, is light brownish yellow, olive yellow, gray, or grayish brown.

Bosque series

The Bosque series consists of deep, well drained, loamy soils on flood plains of streams. They formed in calcareous loamy alluvium.

Typical pedon of Bosque clay loam, frequently flooded, in north part of Austin county; from intersection of Texas Highway 36 and Texas Highway 36 Business Cutoff near Kenney, 1.3 miles north on Texas Highway 36, 3.0 miles east on county road, 100 feet north of road in rangeland:

A1—0 to 25 inches; very dark grayish brown (10YR 3/2) clay loam, dark grayish brown (10YR 4/2) dry; moderate medium subangular blocky structure; hard, friable; many medium roots; few fine concretions of calcium carbonate; calcareous; moderately alkaline; clear smooth boundary.

B2—25 to 35 inches; very dark grayish brown (10YR 3/2) clay loam, dark grayish brown (10YR 4/2) dry; weak medium subangular blocky structure; hard, friable; common fine roots; calcareous; moderately alkaline; abrupt smooth boundary.

IIC1—35 to 42 inches; grayish brown (10YR 5/2) fine sandy loam, light brownish gray (10YR 6/2) dry; massive; slightly hard, friable; few fine roots; calcareous; moderately alkaline; abrupt smooth boundary.

IIC2—42 to 70 inches; dark grayish brown (10YR 4/2) fine sandy loam grayish brown (10YR 5/2) dry; massive; slightly hard, friable; calcareous; moderately alkaline.

The clay content between 10 and 40 inches is 20 to 35 percent.

The A horizon is very dark brown, very dark grayish brown, or dark brown when moist. Texture is loam or clay loam.

The B2 horizon is light brown or pale brown clay loam, loam, or sandy clay loam. This layer is not present in some pedons.

The IIC horizon is light brownish gray, grayish brown, dark grayish brown, or dark gray. Texture is mostly sandy clay loam, clay loam, or loam. Some pedons are underlain by clay at a depth of more than 40 inches.

Boy series

The Boy series consists of deep, somewhat poorly drained, sandy soils on uplands. They formed in thick, loamy unconsolidated coastal plain sediment. Slope ranges from 1 to 5 percent.

Typical pedon of Boy loamy fine sand, 1 to 5 percent slopes, in northeast part of Waller County; from intersection of the Waller County line and Farm Road 1774 north of Fetzer, 0.6 mile north on Farm Road 1774, 1.0 mile southeast on county road, 1.9 miles west on Carlton Speed Road, 100 feet north of road and 100 feet east of powerline right-of-way in woodland:

A1—0 to 4 inches; grayish brown (10YR 5/2) loamy fine sand; light brownish gray (10YR 6/2) dry; single grained; loose; common medium roots; very strongly acid; gradual smooth boundary.

A21—4 to 29 inches; very pale brown (10YR 7/4) loamy fine sand, pink (7.5YR 8/4) dry; single grained; loose; common medium roots; strongly acid; gradual smooth boundary.

A22—29 to 45 inches; very pale brown (10YR 7/4) loamy fine sand, pink (7.5YR 8/4) dry; common medium distinct mottles of reddish yellow (7.5YR 6/6); single grained; loose; few fine roots; strongly acid; abrupt wavy boundary.

B21tg—45 to 55 inches; gray (10YR 6/1) sandy clay loam, light gray (10YR 7/1) dry; common medium distinct mottles of red (2.5YR 4/6) and yellowish brown (10YR 5/6); moderate medium subangular blocky structure; hard, firm; many distinct clay films; 5 to 10 percent plinthite nodules; very strongly acid; gradual wavy boundary.

B22tg—55 to 72 inches; light gray (10YR 7/1) sandy clay loam, white (10YR 8/1) dry, common medium distinct mottles of strong brown (7.5YR 5/6); moderate medium subangular blocky structure; hard, firm; common distinct clay films; 10 percent plinthite nodules; very strongly acid.

The solum ranges from 70 inches to more than 100 inches in thickness.

The A horizon is 40 to 60 inches thick. The A1 horizon is grayish brown, light brownish gray, gray, light gray, or pale brown when moist. The A2 horizon is very pale brown, white, light gray, pinkish gray, or pink with few to common reddish yellow mottles. Reaction is slightly acid to very strongly acid. The boundary between the A and B horizons is abrupt to gradual.

The B21tg horizon is gray and grayish brown mottled with light brownish gray, light gray, brownish yellow, red, strong brown, yellowish red, and reddish yellow. Texture is fine sandy loam or sandy clay loam with 15 to 35 percent clay. Reaction is very strongly acid to strongly acid.

The B22tg horizon is prominently to distinctly mottled with light brownish gray, yellowish red, red, white, gray, strong brown, and yellowish brown. Clay content is 20 to 35 percent clay. Reaction is very strongly acid to medium acid.

Brazoria series

The Brazoria series consist of deep, somewhat poorly drained, clayey soils on flood plains along the Brazos River. They formed in thick clayey alluvial sediment. Slope range from 0 to 3 percent.

Typical pedon of Brazoria clay, 0 to 1 percent slopes (fig. 10), in northwest part of Waller County; from intersection of Farm Road 1736 and Texas Highway 6 north of Hempstead, 2.4 miles west on Farm Road 1736, 2.0 miles north on private road, 50 feet west of road in cultivated field:

Ap—0 to 6 inches; dark reddish brown (5YR 3/3) clay, reddish brown (5YR 4/3) dry; moderate medium subangular blocky structure: extremely hard, extremely firm, very sticky and very plastic; many roots; few fine concretions of calcium carbonate; calcareous; moderately alkaline; abrupt smooth boundary.

A12—6 to 20 inches; dark reddish brown (5YR 3/3) clay, dark reddish brown (5YR 3/3) dry; moderate medium blocky structure; extremely hard, extremely firm, very sticky and very plastic; common medium roots; few fine slickensides; few fine concretions of calcium carbonate; moderately alkaline; gradual wavy boundary.

B21—20 to 45 inches; reddish brown (5YR 4/3) clay, reddish brown (5YR 5/3) dry; few streaks of dark reddish brown (5YR 3/3) material; moderate medium blocky structure; extremely hard, extremely firm, very sticky and very plastic; few fine roots; common intersecting slickensides; few fine concretions of calcium carbonate; calcareous; moderately alkaline; gradual wavy boundary.

B22—45 to 65 inches; dark reddish brown (2.5YR 3/4) clay, reddish brown (2.5YR 4/4) dry; moderate medium blocky structure; extremely hard, extremely firm, very sticky and very plastic; common intersecting slickensides; few fine concretions of calcium carbonate; calcareous; moderately alkaline; gradual wavy boundary.

B23—65 to 80 inches; dark reddish brown (5YR 3/2) clay, dark reddish gray (5YR 4/2) dry; moderate medium blocky structure; extremely hard, extremely firm, very sticky and very plastic; common intersecting slickensides; few fine concretions of calcium carbonate; calcareous; moderately alkaline.

Figure 10.—Profile of Brazoria clay, which has blocky structure and slickensides in the subsoil. Scale in decimeters and feet.

The solum is more than 40 inches thick. When the soil is dry, cracks more than 1 cm wide extend from the surface to a depth of 40 inches or more.

The A horizon is 15 to 40 inches thick. The A horizon is reddish brown or dark reddish brown when moist.

The B2 horizon is reddish brown or dark reddish brown. Clay content is 60 to 80 percent.

The C horizon is brown, reddish brown, or dark reddish brown. It is mainly clay but ranges to silt loam, silty clay loam, loam, or silty clay.

Brenham series

The Brenham series consists of deep, well drained, loamy soils on uplands. They formed in unconsolidated loamy sediment weathered from soft sandstone. Slope ranges from 3 to 8 percent.

Typical pedon of Brenham clay loam, 3 to 8 percent slopes (fig. 11), in northwest part of Austin County; from intersection of Farm Road 2502 and county road in Bleiblerville, 0.5 mile southwest on county road, 100 feet west of fence:

A1—0 to 17 inches; very dark brown (10YR 2/2) clay loam, very dark grayish brown (10YR 3/2) dry; moderate medium subangular blocky structure parting to moderate fine granular; slightly hard, friable; many fine roots; calcareous; moderately alkaline; abrupt smooth boundary.

B21ca—17 to 23 inches; light olive brown (2.5Y 5/4) silty clay loam, light yellowish brown (2.5Y 6/4) dry; moderate medium subangular blocky structure; slightly hard, friable; few fine roots; few fine pores; 45 percent calcium carbonate equivalent; calcareous; moderately alkaline; clear wavy boundary.

B22ca—23 to 32 inches; light olive brown (2.5Y 5/6) silty clay loam; moderate medium subangular blocky structure; slightly hard, friable; few soft masses of calcium carbonate; 60 percent calcium carbonate equivalent; calcareous; moderately alkaline; gradual boundary.

B23ca—32 to 37 inches; light olive brown (2.5Y 5/6) silty clay loam; weak medium subangular blocky structure; slightly hard, friable; common soft masses of calcium carbonate; 50 percent calcium carbonate equivalent; calcareous; moderately alkaline; gradual boundary.

B3—37 to 60 inches; mottled yellowish brown (10YR 5/6), light brownish gray (10YR 6/2), and light yellowish brown (10YR 6/4) silty clay loam; weak medium subangular blocky structure; slightly hard, friable; 30 percent calcium carbonate equivalent; calcareous; moderately alkaline.

The solum is 40 to 60 inches thick.

The A horizon is very dark brown or very dark grayish brown when moist.

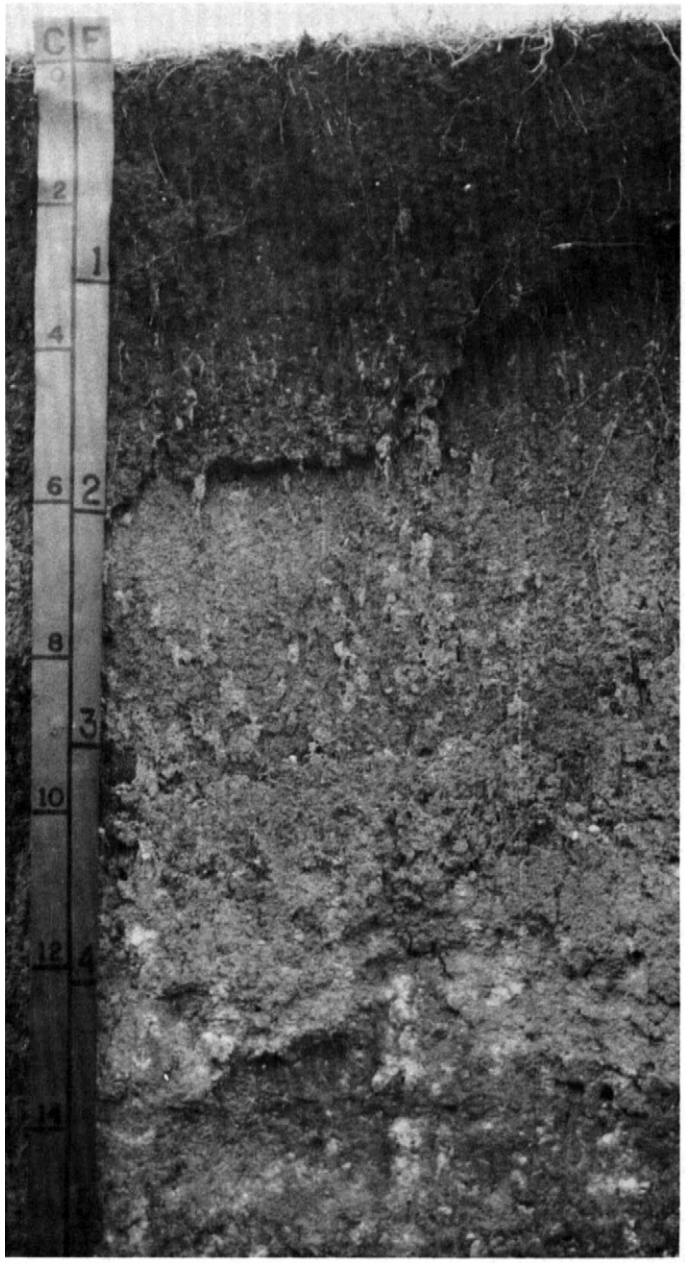


Figure 11.—Profile of Brenham clay loam, which has a dark surface layer and masses of light colored calcium carbonate. Scale in decimeters and feet.

The B21ca and B22ca horizons are light olive brown, light yellowish brown, very pale brown, or brownish yellow. Texture is silty clay loam, clay loam, or clay.

The Cca horizon, where present, is pale yellow or light yellowish brown. Texture is silty clay loam, clay loam, or silt loam.

Burleson series

The Burleson series consists of deep, moderately well drained, clayey soils on ancient stream terraces. They formed in clayey alluvial sediment. Slope ranges from 0 to 1 percent.

Typical pedon of Burleson clay, 0 to 1 percent slopes, northeast of Bellville; from intersection of Texas Highway 159 and Farm Road 1456, 0.7 mile southwest on Texas Highway 159, 100 feet south of road:

A11—0 to 15 inches; very dark gray (10YR 3/1) clay, dark gray (10YR 4/1) dry; moderate medium blocky structure; extremely hard, very firm, very sticky and very plastic; shiny pressure faces on ped surfaces; many fine roots; moderately alkaline; gradual wavy boundary.

A12—15 to 42 inches; very dark gray (10YR 3/1) clay, dark gray (10YR 4/1) dry; moderate medium blocky structure; extremely hard, very firm, very sticky and very plastic; shiny pressure faces on ped surfaces; intersecting slickensides on wedge-shaped peds that have long axes tilted about 45 degrees from the horizontal; few fine roots; moderately alkaline; gradual wavy boundary.

AC—42 to 62 inches; very dark gray (10YR 3/1) clay, dark gray (10YR 4/1) dry; many fine faint mottles of very dark grayish brown (10YR 3/2); moderate fine blocky structure; extremely hard, very firm, very sticky and very plastic; shiny pressure faces on ped surfaces grooved slickensides tilted approximately 45 degrees from horizontal; moderately alkaline; gradual wavy boundary.

C—62 to 70 inches; dark grayish brown (10YR 4/2) clay, grayish brown (10YR 5/2) dry; common fine faint mottles of yellowish brown (10YR 5/4); structureless; many fine concretions of calcium carbonate; calcareous; moderately alkaline.

The solum is more than 60 inches thick in microdepressions and more than 30 inches thick in microknolls. Slickensides extend to within 12 inches of the surface in these soils. When the soil is dry, cracks that are as much as 2 inches wide at the surface extend to a depth of about 40 inches. The microknolls are 3 to 10 inches higher than the microdepressions, and the cycle of microdepression and microknoll is repeated every 8 to 12 feet.

The A horizon is very dark gray or black when moist.

The AC horizon is very dark gray, gray, grayish brown, dark gray, dark grayish brown, light gray, or light brownish gray with few to many weak to distinct mottles of very dark brown, dark grayish brown, gray, and very dark grayish brown.

The C horizon, where present, is light gray with mottles of light brownish gray.

Carbengle series

The Carbengle series consists of moderately deep, well drained, loamy soils on uplands. They formed in weakly cemented sandstone. Slope ranges from 1 to 8 percent.

Typical pedon of Carbengle clay loam, 3 to 5 percent slopes, in northwest part of Austin County; from junction of Texas Highway 389 and Farm Road 1457 in Shelby, 1.3 miles southeast on Farm Road 1457, 100 feet south of road in native pasture:

A1—0 to 10 inches; very dark grayish brown (10YR 3/2) clay loam, dark grayish brown (10YR 4/2) dry; moderate fine subangular blocky structure; slightly hard, friable; many fine roots; common threads and films of calcium carbonate; calcareous; moderately alkaline; clear smooth boundary.

B2ca—10 to 24 inches; light olive brown (2.5Y 5/4) clay loam, light olive brown (2.5Y 5/4) dry; moderate fine subangular blocky structure; hard, friable; common fine roots; few fine hard masses of weakly consolidated sandstone; many soft masses, films, and threads of calcium carbonate; calcareous; moderately alkaline; gradual wavy boundary.

Cr—24 to 58 inches; calcareous, weakly cemented sandstone.

The solum is 20 to 40 inches thick.

The A horizon is 8 to 13 inches thick. The A horizon is very dark brown, dark brown, or very dark grayish brown when moist.

The B horizon is dark yellowish brown, light olive brown, light yellowish brown, or light brownish gray.

The Cr horizon ranges form weakly cemented to strongly cemented sandstone. It can be cut with a spade or auger.

Catilla series

The Catilla series consists of deep, moderately well drained, sandy soils on uplands. They formed in thick, loamy, unconsolidated coastal plain sediment. Slope ranges from 0 to 8 percent.

Typical pedon of Catilla loamy fine sand, 0 to 8 percent slopes, in southwest part of Austin County; from intersection of Farm Road 109 and Farm Road 1094 at New Ulm, 4.0 miles east on Farm Road 1094, 0.3 mile southwest on private road, 100 feet south of the road in bermudagrass pasture:

A1—0 to 5 inches; dark brown (10YR 3/3) loamy fine sand, brown (10YR 4/3) dry; single grained; soft, loose; common fine roots; medium acid; clear smooth boundary.

A21—5 to 45 inches; brown (10YR 5/3) loamy fine sand, pale brown (10YR 6/3) dry; single grained; loose

very friable; common fine roots; medium acid; gradual wavy boundary.

A22—45 to 50 inches; pale brown (10YR 6/3) loamy fine sand, very pale brown (10YR 7/3) dry; weak medium subangular blocky structure; loose, very friable; few fine roots; medium acid; clear wavy boundary.

B21t—50 to 62 inches; pale brown (10YR 6/3) sandy clay loam, very pale brown (10YR 7/3) dry; common medium distinct mottles of red (2.5YR 4/6) and yellowish brown (10YR 5/6); moderate medium subangular blocky structure; hard, firm; few fine roots; common clay films; less than 5 percent plinthite; few ironstone nodules; strongly acid; clear wavy boundary.

B22t—62 to 72 inches; pale brown (10YR 6/3) sandy clay loam, very pale brown (10YR 7/3) dry; common medium distinct mottles of red (2.5YR 4/6) and yellowish brown (10YR 5/6); moderate medium subangular blocky structure; hard, firm; few clay films; few plinthite masses; few ironstone nodules; very strongly acid.

The solum is 60 inches to more than 100 inches thick.

The A horizon is 40 to 60 inches thick. The A1 horizon when dry is very pale brown, pale brown, light brownish gray, light gray, or brown. The A2 horizon when dry is pale brown, very pale brown, or white with common brownish yellow mottles. Reaction is slightly acid to medium acid.

The B2t horizon is pale brown, very pale brown, or light yellowish brown mottled in shades of yellowish brown, red, dark red, and grayish brown. Texture is sandy clay loam or clay with 20 to 45 percent clay. Reaction is medium acid to very strongly acid.

Chazos series

The Chazos series consists of deep, moderately well drained, sandy soils on ancient stream terraces. They formed in sandy and clayey sediment. Slope ranges from 1 to 8 percent.

Typical pedon of Chazos loamy fine sand, 1 to 5 percent slopes (fig. 12), in northeast part of Waller County; from junction of Texas Highway 6 and Farm Road 1736, 1.6 miles east, 0.1 mile north on county road, 200 feet west of road in pasture:

Ap—0 to 8 inches; brown (10YR 4/3) loamy fine sand, pale brown (10YR 6/3) dry; few fine faint mottles of dark yellowish brown (10YR 4/6); weak medium subangular blocky structure; soft, friable; many fine roots; many fine pores; medium acid; clear smooth boundary.

A2—8 to 15 inches; yellowish brown (10YR 5/4) loamy fine sand, light yellowish brown (10YR 6/4) dry; few fine faint mottles of dark yellowish brown (10YR 4/6); weak medium subangular blocky structure; soft, friable; many fine roots; few siliceous pebbles; strongly acid; clear wavy boundary.

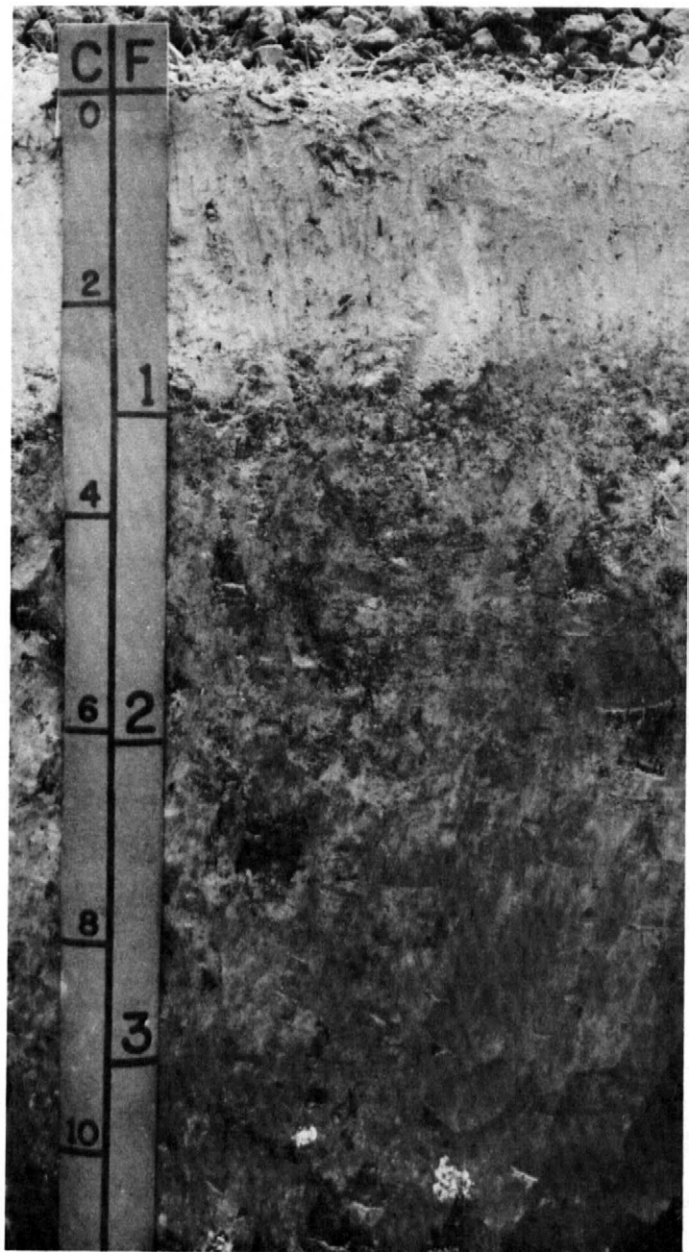


Figure 12.—Profile of Chazos loamy fine sand, which has a light colored surface layer and a clayey subsoil. Scale in decimeters and feet.

B21t—15 to 25 inches; distinctly and coarsely mottled grayish brown (10YR 5/2) and yellowish brown (10YR 5/8) clay; medium coarse subangular blocky structure; very hard, extremely firm; few fine roots; few siliceous pebbles; medium acid; gradual wavy boundary.

B22t—25 to 36 inches; light brownish gray (10YR 6/2) clay, light gray (10YR 7/2) dry; many medium distinct mottles of yellowish brown (10YR 5/8); medium coarse subangular blocky structure; very hard, extremely firm; prominent clay films; medium acid; clear wavy boundary.

B23t—36 to 55 inches; light gray (10YR 7/2) clay, white (10YR 8/2) dry; few fine faint mottles of yellowish brown (10YR 5/8); weak coarse subangular blocky structure; very hard, extremely firm; prominent clay films; few fine lumps of gypsum; slightly acid; clear wavy boundary.

C—55 to 66 inches; light gray (10YR 7/2) clay, white (10YR 8/2) dry; few fine faint mottles of strong brown (7.5YR 5/8); massive; hard, firm; many fine granules of gypsum; neutral.

The solum is 45 to 80 inches thick. Fine siliceous pebbles are throughout some pedons.

The A horizon is 10 to 20 inches thick. The Ap horizon when dry is brown or pale brown. The A2 horizon is very pale brown, light yellowish brown, or pink when dry. Reaction is medium acid to strongly acid.

The B21t horizon is yellowish brown, yellowish red, reddish brown, white, or light gray with common mottles in shades of yellow, brown, gray, and red. Texture is clay or sandy clay. Reaction is medium acid or slightly acid.

The B22t horizon is strong brown, light brownish gray, brownish yellow, red, yellowish brown, white, gray, or light gray or is mottled in these colors. Reaction is medium acid to neutral.

The B23t, B3, and IIC horizons, where present, are dark yellowish brown, yellowish red, red, or light gray with common mottles in shades of gray, red, yellow, and brown. Texture is sandy clay loam, sandy clay, or clay. Reaction is medium acid to neutral. Concretions and soft lumps of calcium carbonate are in some pedons.

Clemville series

The Clemville series consists of deep, well drained, loamy soils on flood plains. They formed in loamy and clayey alluvium. Slope ranges from 0 to 1 percent.

Typical pedon of Clemville silt loam, occasionally flooded, in southern Austin County; from intersection of Farm Road 1093 and Farm Road 1458 2.0 miles northeast of Wallis, 1.8 miles north on Farm Road 1458, 300 feet east of road in cropland:

Ap—0 to 8 inches; reddish brown (5YR 4/4) silt loam, reddish brown (5YR 5/4) dry; moderate medium subangular blocky structure; slightly hard, friable; many roots and pores; calcareous; moderately alkaline; clear smooth boundary.

A12—8 to 20 inches; reddish brown (5YR 4/4) silt loam, reddish brown (5YR 5/4) dry; moderate medium subangular blocky structure; slightly hard, friable; few roots; few fine concretions of calcium carbonate; calcareous; moderately alkaline; abrupt smooth boundary.

C1—20 to 25 inches; reddish brown (5YR 4/4) silt loam, reddish brown (5YR 5/4) dry; massive; slightly hard, friable; few concretions of calcium carbonate; calcareous; moderately alkaline; abrupt smooth boundary.

Ab—25 to 60 inches; dark reddish brown (5YR 2/2) clay, dark reddish brown (5YR 3/2) dry; structureless; extremely hard, extremely firm; concretions of calcium carbonate; calcareous; moderately alkaline.

The depth to a horizon that is more than 35 percent clay is 24 to 36 inches.

The A horizon is light reddish brown, reddish brown, yellowish red, brown, or strong brown when moist.

The C horizon has the same colors as the A horizon. Texture is silt loam or silty clay loam. Abundance of bedding planes ranges from few to many.

The Ab horizon ranges from reddish brown to black. Texture is silty clay loam, clay, silty clay, or clay loam.

Conroe series

The Conroe series consists of deep, moderately well drained, sandy soils on uplands. They formed in thick, loamy, unconsolidated coastal plain sediment. Slope ranges from 1 to 5 percent.

Typical pedon of Conroe loamy fine sand, 1 to 5 percent slopes, in northeast part of Waller County; from intersection of Farm Road 362 and Farm Road 1488, 8.7 miles east on Farm Road 1488, 5.6 miles south and west on Joseph Road, 200 feet north of road in woodland:

A1—0 to 6 inches; brown (10YR 4/3) loamy fine sand, brown (10YR 5/3) dry; weak fine granular structure; loose; many coarse roots; few ironstone nodules; medium acid; clear smooth boundary.

A2—6 to 22 inches; light yellowish brown (10YR 6/4) gravelly loamy fine sand, very pale brown (10YR 7/4) moist; single grained; loose; common fine roots; 40 percent ironstone nodules; strongly acid; clear smooth boundary.

B21t—22 to 25 inches; yellowish brown (10YR 5/8) sandy clay; few fine prominent mottles of red (2.5YR 4/8); weak medium subangular blocky structure; hard, firm; few fine roots; few ironstone nodules; about 20 percent plinthite; common distinct clay films; strongly acid; clear smooth boundary.

B22t—25 to 30 inches; yellowish brown (10YR 5/8) clay; common medium prominent mottles of red (2.5YR 4/8); moderate medium subangular blocky structure; very hard, very firm; few fine roots; common distinct clay films; approximately 20 percent plinthite; very strongly acid; clear smooth boundary.

B23t—30 to 50 inches; coarsely and prominently mottled red (2.5YR 4/8), yellowish brown (10YR 5/8), and light brownish gray (10YR 6/2) clay; moderate medium subangular blocky structure; very hard, very firm; about 25 percent plinthite; common clay films; very strongly acid; gradual smooth boundary.
B3—50 to 70 inches; coarsely and prominently mottled strong brown (7.5YR 5/8), red (10YR 4/8), and light gray (10YR 7/2) clay; weak medium subangular blocky structure; very hard, very firm; few thin clay films; about 25 percent plinthite; very strongly acid.

The solum is 60 inches to more than 100 inches thick.

The A horizon is 20 to 25 inches thick. The A1 horizon is brown, dark grayish brown, grayish brown, or light brownish gray when moist. The A2 horizon is light yellowish brown, pale brown, brownish yellow, light brownish gray, or grayish brown. The A horizon is loamy fine sand or gravelly loamy fine sand. Reaction is slightly acid to very strongly acid.

The B21t horizon is yellowish brown, brownish yellow, or reddish yellow with a few fine prominent mottles of red. It is sandy clay, sandy clay loam, or clay loam. The content of ironstone nodules ranges from none to 25 percent by volume. Content of plinthite ranges from none to 10 percent.

The B22t horizon is yellowish brown or brownish yellow with common to many mottles of yellowish red, red, or dark red. Texture is sandy clay or clay. Content of plinthite ranges from 10 to 40 percent.

The B23t and B3 horizons are reticulately and coarsely mottled red, dark red, light brownish gray, grayish brown, light gray, yellowish brown, strong brown, or pale brown. They are sandy clay or clay. Content of plinthite ranges from 10 to 40 percent.

Crockett series

The Crockett series consists of deep, moderately well drained, loamy soils on uplands. They formed in clay and shale. Slope ranges from 1 to 8 percent.

Typical pedon of Crockett fine sandy loam, 1 to 5 percent slopes, northwest of Bellville; from junction of Texas Highway 36 and Texas Highway 159 west of Bellville, 1.8 miles northwest on Highway 36, 3.7 miles northwest on paved county road, 200 feet southwest of road in pasture:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) fine sandy loam, grayish brown (10YR 5/2) dry; moderate medium subangular blocky structure; very hard, friable; many fine roots; slightly acid; abrupt smooth boundary.
B21t—8 to 19 inches; brown (10YR 4/3) clay; many fine distinct yellowish brown (10YR 5/6) and red (2.5YR 4/8) mottles; moderate fine blocky structure; extremely hard, very firm; many fine roots; prominent thick clay films; medium acid; clear wavy boundary.
B22t—19 to 36 inches; olive brown (2.5Y 4/4) clay; common fine distinct dark grayish brown (10YR 4/2) and yellowish brown mottles (10YR 5/6); moderate medium subangular blocky structure; extremely hard, very firm; few fine roots; prominent thick clay films; slightly acid; gradual smooth boundary.
B23t—36 to 50 inches; olive brown (2.5Y 4/4) clay; few fine distinct dark grayish brown (10YR 4/2) and yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; extremely hard, very firm; few fine black concretions; few fine concretions of calcium carbonate; few distinct clay films; mildly alkaline; gradual smooth boundary.
B31—50 to 61 inches; yellowish red (5YR 4/6) clay; weak medium subangular blocky structure; extremely hard, firm; few fine concretions of calcium carbonate; few faint clay films; mildly alkaline; clear smooth boundary.
C—61 to 72 inches; yellowish red (5YR 4/6) clay loam; massive; firm few concretions of calcium carbonate; mildly alkaline.

The solum is 40 inches to more than 60 inches thick. The depth to carbonates is 30 to 60 inches. When dry, these soils have cracks that are 1 cm or more wide in the upper part of the subsoil.

The A horizon is mostly less than 10 inches thick but is as much as 15 inches thick in subsoil troughs. The A horizon when moist is grayish brown, brown, dark grayish brown, dark brown, or very dark grayish brown. Reaction is medium acid to neutral.

The B2t horizon is clay to sandy clay and in the upper 20 inches is 40 to 50 percent clay. The B21t horizon is brown mottled in shades of yellow, brown, red, and gray. It is medium acid to mildly alkaline. The B22t, B23t, and B3 horizons are mainly shades of olive yellow and brown. Concretions and soft masses of calcium carbonate are few to many. Reaction is slightly acid to moderately alkaline.

The C horizon is clay, sandy clay loam, or clay. In some pedons this horizon is calcareous.

Cuero series

The Cuero series consists of deep, well drained, loamy soils on uplands. They formed in calcareous loamy material weathered from weakly cemented sandstone. Slope ranges from 1 to 8 percent.

Typical pedon of Cuero loam, 1 to 3 percent slopes, in northwest part of Austin county; from junction of Texas Highway 109 and Farm Road 2502, 0.7 mile northwest on Farm Road 2502, 200 feet east of road in bermudagrass pasture:

A1—0 to 14 inches; very dark brown (10YR 2/2) loam, very dark grayish brown (10YR 3/2) dry; weak fine granular structure; slightly hard, friable, slightly sticky

and slightly plastic; many medium roots and pores; common worm casts; mildly alkaline; clear smooth boundary.

B1—14 to 22 inches; very dark grayish brown (10YR 3/2) sandy clay loam, dark grayish brown (10YR 4/2) dry; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; common thin clay films on peds; mildly alkaline; clear smooth boundary.

B21t—22 to 35 inches; dark yellowish brown (10YR 4/4) sandy clay loam, yellowish brown (10YR 5/4) dry; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; common distinct clay films; mildly alkaline; gradual smooth boundary.

B31ca—35 to 45 inches; reddish brown (5YR 4/4) sandy clay loam, reddish brown (5YR 5/4) dry; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; common distinct clay films; few fine concretions of calcium carbonate; moderately alkaline; gradual smooth boundary.

B32ca—45 to 55 inches; yellowish red (5YR 4/6) sandy clay loam, yellowish red (5YR 5/6) dry; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few thin clay films on peds; few thin films and threads of calcium carbonate; moderately alkaline; gradual smooth boundary.

Cca—55 to 65 inches; strong brown (7.5YR 5/6) fine sandy loam, strong brown (7.5YR 5/6) dry; massive; slightly hard, loose, nonsticky and nonplastic; fine concretions of calcium carbonate; moderately alkaline.

The solum is 30 to 60 inches thick. The mollic epipedon is 21 to 26 inches thick. The depth to films, threads, and soft masses of calcium carbonate ranges from 25 to 36 inches.

The A horizon is very dark brown, very dark grayish brown, or dark brown when moist. Reaction is neutral to mildly alkaline.

The B1t and B2t horizons are dark yellowish brown, dark grayish brown, dark brown, brown, yellowish red, or strong brown. Texture is sandy clay loam or clay loam. Reaction is mildly alkaline to moderately alkaline. The B3ca horizon is brown, yellow, or reddish brown. Threads, films, and soft masses of calcium carbonate are few to common.

The C horizon is strong brown, yellow, or reddish brown fine sandy loam or weakly cemented sandstone. In some pedons layers of clay loam and sandy clay loam are in this horizon.

Depcor series

The Depcor series consists of deep, moderately well drained, sandy soils on uplands. They formed in sandy and loamy coastal plain sediment. Slope ranges from 1 to 5 percent.

Typical pedon of Depcor loamy fine sand, 1 to 5 percent slopes, east of Hempstead; from intersection of Farm Road 1488 and Farm Road 362, 8.7 miles east on Farm Road 1488, 5.4 miles south and west on Joseph Road, 300 feet north of road in wooded area:

A1—0 to 6 inches; grayish brown (10YR 5/2) loamy fine sand, light gray (10YR 7/2) dry; single grained; loose; common medium roots; strongly acid; clear smooth boundary.

A2—6 to 22 inches; pale brown (10YR 6/3) loamy fine sand, very pale brown (10YR 7/3) dry; single grained; loose; common fine and medium roots; medium acid; clear smooth boundary.

B21t—22 to 28 inches; yellowish brown (10YR 5/6) sandy clay loam, brownish yellow (10YR 6/6) dry; few fine distinct reddish yellow mottles; weak fine subangular blocky structure; slightly hard, friable; few fine roots; strongly acid; clear smooth boundary.

B22t—28 to 40 inches; yellowish brown (10YR 5/6) sandy clay loam; common medium distinct red (2.5YR 4/6) and common fine faint pale brown mottles; moderate medium subangular blocky structure; very hard, very firm; few fine roots; 15 to 20 percent by volume plinthite; few medium ironstone nodules mainly in upper part; strongly acid; clear smooth boundary.

B23t—40 to 51 inches; reticulately mottled brownish yellow (10YR 6/6), light gray (10YR 7/2), and red (2.5YR 4/6) sandy clay loam; moderate medium subangular blocky structure; very hard, very firm; few fine roots; about 20 percent by volume plinthite; strongly acid; clear smooth boundary.

B24t—51 to 72 inches; reticulately mottled light brownish gray (10YR 6/2), red (2.5YR 4/6), and reddish yellow (7.5YR 6/6) sandy clay loam; weak medium subangular blocky structure; very hard, extremely firm; few fine roots; about 15 percent by volume plinthite; strongly acid.

The solum is 60 to 80 inches thick. Depth to a horizon containing 5 to 25 percent plinthite ranges from 25 to 40 inches. Ironstone nodules range from none to common.

The A horizon is 20 to 35 inches thick. The A1 horizon is brown, grayish brown, pale brown, dark brown, or dark yellowish brown when moist. The A2 horizon is light brownish gray, pinkish gray, pale brown, light yellowish brown, or brown. Reaction ranges from strongly acid to medium acid.

The B21t horizon is yellowish brown, strong brown, or brownish yellow with few to common mottles in shades

of yellow, brown, and red. Clay content is about 22 to 30 percent. Reaction ranges from very strongly acid to medium acid.

The B22t, B23t, and B24t horizons, where present, are reticulately mottled in shades of red, yellow, and gray and brown. Texture is sandy clay loam or clay loam. Reaction ranges from very strongly acid to medium acid.

Dutek series

The Dutek series consists of deep, well drained, sandy soils on ancient stream terraces. They formed in sandy and loamy alluvium. Slope ranges from 5 to 8 percent.

Typical pedon of Dutek loamy fine sand, 5 to 8 percent slopes, east of Hempstead; from junction of Texas Highway 6 and Farm Road 1488, 0.8 mile east on Farm Road 1488, 100 feet north of road:

A1—0 to 8 inches; yellowish brown (10YR 5/4) loamy fine sand, very pale brown (10YR 7/4) dry; single grained; loose; many medium roots; medium acid; abrupt smooth boundary.

A2—8 to 25 inches; light yellowish brown (10YR 6/4) loamy fine sand, very pale brown (10YR 8/4) dry; single grained; loose; many medium roots; medium acid; clear smooth boundary.

B21t—25 to 32 inches; yellowish red (5YR 5/8) sandy clay loam, reddish yellow (5YR 6/8) dry; moderate medium subangular blocky structure; hard, friable; common fine roots; common distinct clay films; very strongly acid; clear smooth boundary.

B22t—32 to 45 inches; strong brown (7.5YR 5/6) sandy clay loam; common medium distinct mottles of yellowish red (5YR 5/8) and red (2.5YR 4/6); moderate medium subangular blocky structure; hard, friable; few fine roots; common distinct clay films; very strongly acid; clear smooth boundary.

B31t—45 to 58 inches; strong brown (7.5YR 5/8) fine sandy loam; common medium distinct mottles of red (2.5YR 4/6); moderate fine subangular blocky structure; hard, friable; patchy clay films; very strongly acid; clear smooth boundary.

B32t—58 to 72 inches; strong brown (7.5YR 5/6) fine sandy loam; many coarse distinct mottles of red (2.5YR 4/6) and yellowish red (5YR 5/8); weak fine subangular blocky structure; patchy clay films; very strongly acid.

The solum is 45 inches to more than 72 inches thick.

The A horizon is 20 to 40 inches thick. The Ap or A1 horizon is pale brown, yellowish brown, light brown, or brown when dry. The A2 horizon is light yellowish brown, very pale brown, or strong brown when dry. Reaction is neutral to medium acid.

The B2t horizon is yellowish red, strong brown, dark red, or red. Reaction ranges from medium acid to very strongly acid. The B22t horizon has common medium distinct mottles of red and yellowish red.

The B3t horizon is red, yellowish red, and strong brown. It has common medium distinct mottles of red and yellowish red. Texture is fine sandy loam, sandy loam, or sandy clay loam. Reaction is medium acid to very strongly acid.

Edna series

The Edna series consists of deep, poorly drained, loamy soils on uplands. They formed in thick unconsolidated clayey coastal plain sediment. Slope ranges from 0 to 3 percent.

Typical pedon of Edna fine sandy loam, 0 to 1 percent slopes, in southern part of Waller County; from junction of Farm Road 359 and Farm Road 529, 0.3 mile south on Farm Road 359, 100 feet east of road in pasture:

Ap—0 to 8 inches; light brownish gray (10YR 6/2) fine sandy loam, light gray (10YR 7/2) dry; weak fine subangular blocky structure; hard, firm; common medium roots and pores; medium acid; abrupt smooth boundary.

B21tg—8 to 25 inches; dark gray (10YR 4/1) clay, gray (10YR 5/1) dry; common fine faint mottles of brown (7.5YR 5/4); moderate medium blocky structure; extremely hard, extremely firm; few fine roots; medium acid; clear wavy boundary.

B22tg—25 to 39 inches; dark gray (10YR 4/1) clay, gray (10YR 5/1) dry; common medium distinct mottles of brown (7.5YR 5/4) and light brownish gray (2.5Y 6/2); moderate medium blocky structure; extremely hard, extremely firm; few fine roots; neutral; clear wavy boundary.

B31tg—39 to 55 inches; light brownish gray (2.5Y 6/2) clay, light gray (2.5Y 7/2) dry; common medium distinct mottles of grayish brown (10YR 5/2); weak medium blocky structure; extremely hard, extremely firm; common medium concretions of calcium carbonate; moderately alkaline; clear smooth boundary.

B32tg—55 to 65 inches; light yellowish brown (2.5YR 6/4) clay, pale yellow (2.5YR 7/4) dry; weak medium blocky structure; extremely hard, extremely firm; few medium concretions of calcium carbonate; moderately alkaline.

The solum is 60 to 80 inches thick. When dry, these soils have cracks that are 1 cm or more wide in the upper part of the subsoil. Few to common concretions of calcium carbonate are present in the lower part of the subsoil in some pedons.

The A horizon ranges from less than 10 inches thick on highs of the subsoil to as much as 20 inches thick in troughs. The A horizon is light brownish gray or light gray when moist. Reaction is medium acid to neutral. The boundary between the A and B horizons is abrupt to clear.

The B21tg horizon is dark gray, gray, grayish brown, or dark grayish brown with few to common mottles in shades of olive brown, yellowish brown, strong brown, and brown. Clay content ranges form 35 to 50 percent. Reaction ranges from medium acid to neutral.

The B22tg horizon is dark gray, dark grayish brown, or gray with none to common mottles of yellowish brown, brown, and olive brown. Clay content is 40 to 50 percent. Reaction is medium acid to neutral.

The B3 horizon is 35 to 55 percent clay. Reaction is neutral to moderately alkaline. This horizon has few to common concretions and soft lumps of calcium carbonate.

Eufaula series

The Eufaula series consists of deep, somewhat excessively drained, sandy soils on ancient stream terraces on uplands. They formed in sandy sediment. Slope ranges from 0 to 6 percent.

Typical pedon of Eufaula fine sand, 0 to 5 percent slopes, west of Bellville; from county courthouse in Bellville, 4.3 miles west on Texas Highway 159, 0.2 mile south on a private road, 75 feet west of road in open pasture:

A1—0 to 9 inches; brown (10YR 5/3) fine sand, pale brown (10YR 6/3) dry; single grained; loose; common fine roots; medium acid; clear smooth boundary.

A21—9 to 54 inches; yellowish brown (10YR 5/4) fine sand, very pale brown (10YR 7/4) dry; single grained; loose; few fine roots; medium acid; clear smooth boundary.

A22&B21t—54 to 80 inches; light yellowish brown (10YR 6/4) fine sand; many yellowish red (5YR 4/6) sandy clay loam and sandy loam lamellae about 1/2 inch thick make up about 25 percent of the horizon; single grained; loose; medium acid; clear smooth boundary.

The A horizon is 50 to 80 inches thick. The A1 or Ap horizon when moist is brown, yellowish brown, pale brown, or light yellowish brown. It is fine sand or loamy fine sand. Reaction is strongly acid to slightly acid. The A21 horizon is reddish brown, yellowish brown, light yellowish brown, reddish yellow, or pinkish gray. It is fine sand or loamy fine sand. Reaction is strongly acid to slightly acid.

The A22&B21t horizon is loamy fine sand or fine sand (A22) with lamellae, or bands, of sandy clay loam or fine sandy loam (B21t) 1/4 to 1 inch thick. The A22 part is reddish brown, yellowish brown, light yellowish brown, reddish yellow, or pinkish gray. The B21t part is yellowish red, reddish brown, reddish yellow, or red. Reaction of this horizon is slightly acid to very strongly acid.

Fetzer series

The Fetzer series consists of deep, somewhat poorly drained soils on uplands. They formed in thick, loamy unconsolidated coastal plain sediment. Slope ranges from 1 to 5 percent.

Typical pedon of Fetzer loamy fine sand, 1 to 5 percent slopes, in northeast Waller County; from intersection of Farm Road 362 and Farm Road 1488, 8.7 miles east on Farm Road 1488, 3.1 miles south on Joseph Road, 0.5 mile southeast on Robinhood Lane, 100 feet west of the road in woodland:

A1—0 to 6 inches; dark yellowish brown (10YR 4/4) loamy fine sand, yellowish brown (10YR 5/4) dry; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many fine and medium roots; strongly acid; clear smooth boundary.

A21—6 to 24 inches; very pale brown (10YR 7/4) loamy fine sand, very pale brown (10YR 8/4) dry; single grained; loose, very friable, nonsticky and nonplastic; many fine and medium roots; medium acid; clear smooth boundary.

A22—24 to 28 inches; very pale brown (10YR 7/3) loamy fine sand, very pale brown (10YR 8/3) dry; fine faint yellowish brown mottles; single grained; slightly hard, very friable, nonsticky and nonplastic; common fine and medium roots; medium acid; clear smooth boundary.

B21tg—28 to 39 inches; grayish brown (10YR 5/2) clay loam, light brownish gray (10YR 6/2) dry; many coarse prominent dark red (2.5YR 3/6) and yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky; hard, firm, slightly sticky and slightly plastic; few fine roots; common distinct clay films; very strongly acid; clear wavy boundary.

B22tg—39 to 74 inches; light brownish gray (10YR 6/2) clay loam, light brownish gray (10YR 6/2) dry; many coarse prominent dark red (2.5YR 3/6) mottles; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; continuous clay films; few plinthite nodules; very strongly acid.

The solum is more than 60 inches thick.

The A horizon is 20 to 40 inches thick. The A1 horizon is dark yellowish brown, pale brown, yellowish brown, or brown when moist. The A2 horizon is very pale brown or pink. Reaction is slightly acid to very strongly acid. The boundary between the A and B horizons is clear to abrupt.

The B21tg horizon is grayish brown or light brownish gray mottled in shades of yellowish brown, reddish yellow, and red. Texture is clay loam or sandy loam with 30 to 35 percent clay. Reaction is strongly acid to very strongly acid.

The B22tg horizon is prominently to distinctly mottled in shades of yellowish brown, dark reddish brown, strong

brown, and brownish yellow. It is clay or sandy clay with 35 to 50 percent clay. Reaction ranges from strongly acid to very strongly acid.

Frelsburg series

The Frelsburg series consists of deep, well drained, clayey soils on uplands. They formed in weakly consolidated calcareous clay. Slope ranges from 1 to 8 percent but is dominantly 1 to 5 percent.

Typical pedon of Frelsburg clay, 3 to 5 percent slopes; from Bleiblerville, 1.5 miles northwest on Farm Road 2502, 1.8 miles northeast on county road, 300 feet southeast of road in cultivated field:

Ap—0 to 4 inches; very dark gray (10YR 3/1) clay, dark gray (10YR 4/1) dry; moderate medium granular structure; extremely hard, very firm, very sticky and very plastic; common fine roots; few siliceous pebbles; few fine concretions of calcium carbonate; calcareous; moderately alkaline; abrupt smooth boundary.

A1—4 to 15 inches; dark gray (10YR 4/1) clay, gray (10YR 5/1) dry; moderate medium granular structure; extremely hard, very firm, very sticky and very plastic; common fine roots; few siliceous pebbles; few fine concretions of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

AC—15 to 40 inches; dark grayish brown (10YR 4/2) clay; common fine distinct yellowish brown (10YR 5/4) mottles; moderate medium angular blocky structure; extremely hard, very firm, very sticky and very plastic; few fine roots; common large slickensides; few fine concretions of calcium carbonate; calcareous; moderately alkaline; gradual wavy boundary.

ACca—40 to 55 inches; dark grayish brown (10YR 4/2) clay; common fine distinct yellowish brown (10YR 5/4) mottles; moderate medium angular blocky structure; extremely hard, very firm, very sticky and very plastic; common large slickensides; common fine concretions of calcium carbonate; calcareous; moderately alkaline; gradual wavy boundary.

Cca—55 to 65 inches; light brownish gray (2.5Y 6/2) clay; common fine distinct dark grayish brown (10YR 4/2) and brownish yellow (10YR 6/6) mottles; massive; extremely hard, very firm, very sticky and very plastic; few slickensides; few concretions of calcium carbonate; calcareous; moderately alkaline.

The A and AC horizons combined are 50 inches to more than 100 inches thick. When dry the soil has cracks that are as much as 3 inches wide at the surface and extend to a depth of about 4 feet. Intersecting slickensides begin at a depth of about 10 inches. The soil is clay or silty clay throughout. Virgin areas have microknolls 4 to 10 inches higher than microdepressions. The cycle of microdepression and microknoll is repeated at intervals of 5 to 15 feet.

The A horizon is black, very dark gray, dark gray, or gray when dry.

The AC horizon is dark grayish brown, grayish brown, light gray, light brownish gray, and light olive gray. Some pedons are mottled in shades of gray, brown, and yellow. Most pedons have common concretions of calcium carbonate.

The Cca horizon, where present, is light gray or light brownish gray with common coarse prominent yellow and olive mottles.

Hockley series

The Hockley series consists of deep, moderately well drained, loamy soils on uplands. They formed in thick, unconsolidated, loamy coastal plain sediment. Slope ranges from 1 to 5 percent.

Typical pedon of Hockley fine sandy loam, 1 to 3 percent slopes, in northeast part of Waller County; from the junction of Farm Road 1098 and Farm Road 1488, 0.6 mile north and east on Farm Road 1488, 700 feet east of road in cropland:

Ap—0 to 7 inches; brown (10YR 5/3) fine sandy loam, very pale brown (10YR 7/3) dry; weak medium subangular blocky structure; soft, friable; common medium roots; strongly acid; abrupt smooth boundary.

A2—7 to 22 inches; grayish brown (10YR 5/2) fine sandy loam, light brownish gray (10YR 6/2) dry; moderate fine subangular blocky structure; slightly hard, friable; many fine roots; strongly acid; clear wavy boundary.

B21t—22 to 32 inches; yellowish brown (10YR 5/4) sandy clay loam, light yellowish brown (10YR 6/4) dry; few fine faint mottles of yellowish red (5YR 5/6); moderate medium subangular blocky structure; hard, friable; few fine roots; few ironstone nodules; discontinuous clay strippings on peds; strongly acid; gradual wavy boundary.

B22t—32 to 45 inches; light yellowish brown (10YR 6/4) sandy clay loam, very pale brown (10YR 8/4) dry; common medium distinct mottles of red (2.5YR 4/6), very pale brown (10YR 7/3), and dark grayish brown (10YR 4/2); moderate medium subangular blocky structure; hard, friable; few fine roots; prominent clay films on peds; few ironstone nodules; 8 to 10 percent plinthite; strongly acid; gradual wavy boundary.

B23t—45 to 61 inches; light gray (10YR 7/2) sandy clay loam, white (10YR 8/2) dry; common medium distinct mottles of brownish yellow (10YR 6/6); moderate medium prismatic structure parting to moderate medium subangular blocky; very hard,

firm; few ironstone nodules; 10 percent plinthite; prominent clay films on peds; medium acid.

The solum is more than 80 inches thick.

The A horizon is 20 to 40 inches thick. The Ap horizon is brown, pale brown, light brownish gray, light brown, or white when dry. Texture is fine sandy loam or gravelly fine sandy loam. Reaction is slightly acid to strongly acid. The boundary between the A and B horizons is abrupt to gradual.

The B21t horizon in most pedons is yellowish brown mottled in shades of dark red, light yellowish brown, yellowish brown, red, dark yellowish brown, strong brown, brown, yellowish red, and brownish yellow. Texture is sandy clay loam with 25 to 35 percent clay. Reaction is strongly acid to medium acid.

The B22t horizon is light yellowish brown to light gray and is distinctly mottled in shades of brownish yellow, dark red, light yellowish brown, grayish brown, red, yellowish brown, and strong brown. It is sandy clay loam or sandy clay and ranges from 25 to 39 percent clay. Reaction is strongly acid to slightly acid.

Katy series

The Katy series consists of deep, somewhat poorly drained, loamy soils on uplands. They formed in thick, unconsolidated, loamy and clayey coastal plain sediment. Slope ranges from 0 to 3 percent.

Typical pedon of Katy fine sandy loam, 0 to 1 percent slopes, in southeast part of Waller County; from junction of Farm Road 529 and Farm Road 2855, 1.0 mile south on Farm Road 2855, 0.4 mile west on private road, 50 feet north of road in cultivated field:

Ap—0 to 6 inches; grayish brown (10YR 5/2) fine sandy loam, light brownish gray (10YR 6/2) dry; weak fine subangular blocky structure; hard, firm; common medium roots; medium acid; abrupt smooth boundary.

A12—6 to 10 inches; grayish brown (10YR 5/2) fine sandy loam, light brownish gray (10YR 6/2) dry; weak fine subangular blocky structure; hard, firm; common medium roots; few ironstone nodules; medium acid; clear smooth boundary.

A2—10 to 22 inches; pale brown (10YR 6/3) fine sandy loam, very pale brown (10YR 7/3) dry; common medium distinct mottles of yellowish brown (10YR 5/4); weak fine subangular blocky structure; hard, firm; few fine roots; few ironstone nodules; slightly acid; abrupt wavy boundary.

B21t—22 to 29 inches; grayish brown (10YR 5/2) sandy clay loam; light brownish gray (10YR 6/2) dry; common medium distinct mottles of dark yellowish brown (10YR 4/6); moderate medium subangular blocky structure; extremely hard, very firm; few fine roots; thin vertical streaks of fine sandy loam; medium acid; gradual wavy boundary.

B22t—29 to 50 inches; light gray (10YR 6/1) clay, light gray (10YR 6/1) dry; common medium distinct mottles of yellowish brown (10YR 5/6) and dark red (2.5YR 3/6); moderate coarse prismatic structure; extremely hard, very firm; thin vertical streaks of fine sandy loam about 1/2 inch thick; medium acid; gradual wavy boundary.

B23t—50 to 70 inches; gray (10YR 6/1) clay, light gray (10YR 6/1) dry; common medium distinct mottles of yellowish red (5YR 5/6); moderate coarse prismatic structure; extremely hard, very firm; thin films of fine sandy loam on prisms; neutral; gradual wavy boundary.

B24t—70 to 80 inches; light gray (5YR 7/1) clay, white (5YR 8/1) dry; common medium distinct mottles of yellowish red (5YR 5/6) and dark red (2.5YR 3/6); weak medium prismatic structure; extremely hard, very firm; thin vertical streaks of fine sandy loam up to 1/2 inch thick; common black streaks; neutral.

The solum is more than 80 inches thick.

The A horizon is 20 to 30 inches thick. The Ap horizon is grayish brown, light brownish gray, or pale brown when dry. The A2 horizon is very pale brown, white, light yellowish brown, pale brown, light gray, or light brownish gray when dry. Texture is fine sandy loam or loam. Reaction is slightly acid or medium acid.

The B21t horizon is mottled in shades of yellowish brown, red, dark yellowish brown, strong brown, reddish brown, and dark red. Texture is sandy clay loam, sandy clay, or clay with 30 to 50 percent clay. Reaction is strongly acid to slight acid. The lower part of the B2t horizon is prominently to distinctly mottled in brownish yellow, yellowish brown, dark red, strong brown, dark yellowish brown, and red. It is sandy clay or clay with 38 to 55 percent clay. Reaction ranges from strongly acid to neutral.

Kenney series

The Kenney series consists of deep, well drained, sandy soils on uplands. They formed in thick, loamy and sandy, unconsolidated coastal plain sediment. Slope ranges from 1 to 8 percent.

Typical pedon of Kenney loamy fine sand, 1 to 8 percent slopes, in east part of Waller County; from junction of Farm Road 1098 and U.S. Highway 290, 2.1 miles north through Prairie View on Farm Road 1098, 300 feet east of road in bermudagrass pasture:

A1—0 to 8 inches; brown (10YR 5/3) loamy fine sand, pale brown (10YR 6/3) dry; single grained; loose; common fine roots; very strongly acid; clear smooth boundary.

A21—8 to 50 inches; pale brown (10YR 6/3) loamy fine sand, very pale brown (10YR 7/3) dry; single

grained; loose; common fine roots; very strongly acid; gradual smooth boundary.

A22—50 to 62 inches; very pale brown (10YR 7/3) loamy fine sand, very pale brown (10YR 8/3) dry; single grained; loose; common fine roots; few fine siliceous pebbles; strongly acid; clear smooth boundary.

B21t—62 to 70 inches; red (2.5YR 4/6) sandy clay loam, red (2.5YR 5/6) dry; common medium distinct mottles of yellowish brown (10YR 5/8) and brown (10YR 5/3); moderate medium subangular blocky structure; hard, friable; common clay films coating peds; common fine siliceous pebbles; strongly acid; gradual wavy boundary.

B22t—70 to 80 inches; red (2.5YR 4/6) sandy clay loam, red (2.5YR 5/6) dry; few medium prominent mottles of yellowish brown (10YR 5/6); moderate medium subangular blocky structure; hard, friable; common clay films coating peds; strongly acid; gradual smooth boundary.

The solum is 80 inches to more than 100 inches thick.

The A horizon is 40 to 80 inches thick. The A1 horizon when dry is pale brown, pinkish gray, pink, reddish yellow, or very pale brown. Reaction is slightly acid to strongly acid. The boundary between the A and B horizons is abrupt to clear.

The B21t horizon is red or yellowish red mottled in shades of brownish yellow, pale brown, dark yellowish brown, red, yellowish red, reddish yellow, yellowish brown, and brown. Clay content is 20 to 30 percent. Reaction is strongly acid to medium acid.

Klump series

The Klump series consists of deep, well drained, loamy soils on uplands. They formed in thick beds of sandy and loamy material weathered from sandstone. Slope ranges from 3 to 8 percent.

Typical pedon of Klump sandy loam, 3 to 5 percent slopes, in north part of Austin county; from junction of Farm Road 2754 and Texas Highway 36 at the business loop north of Kenney, 6.0 miles northwest on Farm Road 2754, 100 feet northwest of road:

Ap—0 to 8 inches; dark brown (10YR 3/3) sandy loam, brown (10YR 4/3) dry; weak fine subangular blocky structure; slightly hard, friable; many medium roots and pores; slightly acid; clear smooth boundary.

A1—8 to 12 inches; dark brown (7.5YR 3/4) sandy loam, brown (7.5YR 4/4) dry; weak fine subangular blocky structure; slightly hard, friable; many fine roots; common fine pores; medium acid; abrupt smooth boundary.

B21t—12 to 16 inches; dark brown (7.5YR 3/2) sandy clay loam, brown (7.5YR 4/2) dry; weak medium subangular blocky structure; hard, firm; common fine roots; common distinct clay films; medium acid; clear smooth boundary.

B22t—16 to 25 inches; mottled dark brown (7.5YR 3/2) and dark red (2.5YR 3/6) sandy clay loam; moderate medium subangular blocky structure; hard, firm; few fine roots; common distinct clay films; strongly acid; clear wavy boundary.

B23t—25 to 48 inches; red (2.5YR 5/6) sandy clay loam, red (2.5YR 5/6) dry; moderate medium subangular blocky structure; hard, firm; few fine roots; common distinct clay films; strongly acid; gradual smooth boundary.

B3—48 to 55 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 5/6) dry; weak medium subangular blocky structure; hard, firm; few faint clay films; medium acid; gradual smooth boundary.

C—55 to 70 inches; brownish yellow (10YR 6/6) sandy loam, brownish yellow (10YR 6/6) dry; massive; medium acid.

The solum is 40 to 60 inches thick.

The A horizon is very dark grayish brown or dark brown when dry. Reaction ranges from medium acid to mildly alkaline.

The B2t horizon is coarsely mottled with dark brown, dark red, red, brown, strong brown, reddish brown, or yellowish red. Texture is clay loam or sandy clay loam. Reaction is medium acid to neutral.

The B3 horizon is yellowish red, reddish yellow, or strong brown. It is sandy clay loam or sandy loam. This horizon is absent in some pedons. Reaction is medium acid to neutral.

The C horizon is yellow, yellowish red, brownish yellow, or reddish yellow. Texture is sandy clay loam, sandy loam, or loamy sand. Reaction is medium acid to moderately alkaline. In some pedons this horizon is calcareous.

Knolle series

The Knolle series consists of deep, well drained, sandy soils on uplands. They formed in thick beds of sandy and loamy material weathered from sandstone. Slope ranges from 1 to 8 percent but is dominantly 1 to 5 percent.

Typical pedon of Knolle loamy sand, 1 to 5 percent slopes, in north part of Austin County; from junction of Texas Highway 36 and the Kenney cutoff on Texas Highway 36, 1.5 miles north on Texas Highway 36, 2.1 miles east on county road, 50 feet south of road in pasture:

Ap—0 to 8 inches; brown (10YR 4/3) loamy sand, brown (10YR 5/3) dry; weak coarse subangular blocky structure; soft, loose; many medium roots; medium acid; clear smooth boundary.

A1—8 to 18 inches; dark grayish brown (10YR 4/2) loamy sand, grayish brown (10YR 5/2) dry; single grained; loose; many medium and fine roots; medium acid; abrupt wavy boundary.
B21t—18 to 30 inches; dark brown (10YR 3/3) sandy clay loam; brown (10YR 4/3) dry; common fine distinct mottles of strong brown (7.5YR 5/6); moderate medium subangular blocky structure; hard, firm; common fine roots; common faint clay films; strongly acid; clear wavy boundary.
B22t—30 to 45 inches; strong brown (7.5YR 5/6) sandy clay loam, reddish yellow (7.5YR 6/6) dry; common medium distinct mottles of red (2.5YR 4/6); moderate medium subangular blocky structure; hard, firm; few fine roots; common distinct clay films; strongly acid; clear smooth boundary.
B3—45 to 54 inches; yellowish red (5YR 5/8) sandy clay loam, reddish yellow (5YR 6/8) dry; weak medium subangular blocky structure; hard, firm; few faint clay films; strongly acid; gradual smooth boundary.
C—54 to 70 inches; strong brown (7.5YR 5/6) sandy clay loam; structureless; hard, firm; medium acid.

The solum is 40 to 60 inches thick. The depth to the level in the solum where clay content is 20 percent less than the maximum is 40 to 60 inches.

The A horizon when dry is very dark grayish brown, brown, dark grayish brown, grayish brown, or dark brown. Texture is sand or loamy sand. Reaction is medium acid to neutral.

The B2t horizon is brown, reddish brown, dark reddish brown, strong brown, or dark brown with common to many mottles of these colors and dark grayish brown and red.

The B3 horizon is yellowish brown, brownish yellow, reddish yellow, or yellowish red with none to common mottles of brownish yellow and yellowish brown. Texture is sandy clay loam, loam, or sandy loam. Reaction ranges from strongly acid to slightly acid.

The C horizon is strong brown or reddish yellow. Texture is sandy clay loam, loam, or sandy loam. Reaction ranges from strongly acid to slightly acid.

Kuy series

The Kuy series consists of deep, moderately well drained, sandy soils on uplands. They formed in sandy and loamy coastal plain material that has been reworked by wind. Slope ranges from 1 to 5 percent.

Typical pedon of Kuy loamy fine sand, 1 to 5 percent slopes, west of Sealy; from intersection of Texas Highway 36 and U.S. Highway 90, 0.2 mile west on U.S. Highway 90, 0.1 mile south, 4.8 miles southwest on county road, 0.1 mile southeast on county road, 100 feet east of road in bermudagrass pasture:

A1—0 to 15 inches; brown (7.5YR 5/4) loamy fine sand, pink (7.5YR 7/4) dry; single grained; loose, soft, nonsticky and nonplastic; many fine roots; medium acid; clear smooth boundary.
A2—15 to 52 inches; pink (7.5YR 7/4) loamy fine sand, pink (7.5YR 8/4) dry; single grained; loose, soft, nonsticky and nonplastic; common fine roots; medium acid; clear smooth boundary.
B21t—52 to 64 inches; light gray (10YR 7/1) fine sandy loam; common medium distinct yellowish red (5YR 5/6) and yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; slightly hard, very firm, slightly sticky and slightly plastic; few fine roots; strongly acid; clear smooth boundary.
B22t—64 to 72 inches; mottled light gray (10YR 7/1), reddish brown (2.5YR 5/4), and yellowish brown (10YR 5/6) sandy clay loam; weak medium subangular structure; hard, firm, sticky and plastic; few roots; few black concretions; base saturation at a depth of 72 inches is 46 percent; strongly acid.

The A horizon is 40 to 60 inches thick. This horizon is brown, light brown, pink, white, or very pale brown when moist. Texture is loamy fine sand or loamy sand. Reaction is medium acid or slightly acid.

The Bt horizon is dominantly gray or light gray but has few to many mottles in shades of red, yellow, brown, and gray. Texture is fine sandy loam, sandy clay loam, or clay loam; the upper 20 inches of the horizon is 18 to 35 percent clay. Reaction is strongly acid to slightly acid.

The Kuy soils in this survey area have an average annual soil temperature about 2 degrees F cooler than is allowed for the Kuy series. They are therefore considered taxadjuncts to the Kuy series. Use and management are similar.

Lake Charles series

The Lake Charles series consists of deep, somewhat poorly drained, clayey soils on uplands. They formed in clayey coastal plain sediment. Slope ranges from 0 to 3 percent.

Typical pedon of Lake Charles clay, 0 to 1 percent slopes, in southeast part of Austin County; from Frydek, 1.5 miles south and east on Farm Road 1458, 100 feet south of road in rangeland:

Ap—0 to 9 inches; black (10YR 2/1) clay, very dark gray (10YR 3/1) dry; moderate medium subangular blocky structure; extremely hard, very firm, very sticky and very plastic; shiny pressure faces; many fine roots; mildly alkaline; clear wavy boundary.
A11—9 to 33 inches; very dark gray (10YR 3/1) clay, dark gray (10YR 4/1) dry; common coarse wedge-shaped peds that break to moderate fine and medium blocky structure; wedge-shaped peds have long axis tilted 10 to 60 degrees from the horizontal and are bordered by intersecting slickensides;

extremely hard, very firm, very sticky; common fine roots; moderately alkaline; diffuse wavy boundary.

A12—33 to 45 inches; very dark gray (10YR 3/1) clay, dark gray (10YR 4/1) dry; common large wedge-shaped peds that break to moderate medium and coarse blocky structure; wedge-shaped peds have long axis tilted 10 to 60 degrees from the horizontal and are bordered by intersecting slickensides; extremely hard, very firm, very sticky; common fine concretions of calcium carbonate; moderately alkaline; diffuse wavy boundary.

ACg—45 to 62 inches; dark gray (10YR 4/1) clay, gray (10YR 5/1) dry; moderate fine blocky structure; extremely hard, very firm; very sticky and very plastic; few grooved slickensides; common fine concretions of calcium carbonate; moderately alkaline; clear wavy boundary.

C—62 to 69 inches; grayish brown (10YR 5/2) clay, light brownish gray (10YR 6/2) dry; massive; very hard, firm; sticky and plastic; strong brown (7.5YR 5/6) calcareous streaks; moderately alkaline.

The solum is more than 60 inches thick in the microdepressions and more than 40 inches thick in the microknolls. Slickensides or wedge-shaped peds extend to the Ap horizon and are tilted at 30 to 60 degrees from the horizontal. When dry, this soil has cracks that are as much as 2 inches wide at the surface and extend into the ACg horizon. The cycle of microdepression and microknoll is repeated every 6 to 18 feet. In cultivated areas, the microknolls are 3 to 6 inches higher than the microdepressions.

The A horizon is black or very dark gray when moist. Reaction is slightly acid to moderately alkaline.

The ACg horizon is very dark gray, dark gray, or gray. Reaction is neutral to moderately alkaline.

The C horizon, where present, is grayish brown, yellowish red, or strong brown. It is commonly calcareous.

The soils in map units LaB and LaD have chroma of 2 in the AC horizon, which is outside the range for the Lake Charles series. They are therefore considered taxadjuncts to the Lake Charles series. Use and management are similar.

Landman series

The Landman series consists of deep, moderately well drained, sandy soils on uplands. They formed in thick, loamy and sandy coastal plain sediment. Slope ranges from 3 to 12 percent.

Typical pedon of Landman loamy fine sand, 1 to 5 percent slopes, in northeast part of Waller County; from junction of Joseph Road and Farm Road 1488, 1.2 miles west on Farm Road 1488, 0.1 mile north on private road, 100 feet west of road in woodland:

A1—0 to 6 inches; grayish brown (10YR 5/2) loamy fine sand, light brownish gray (10YR 6/2) dry; single grained; loose; common medium roots; medium acid; clear smooth boundary.

A21—6 to 45 inches; light brown (7.5YR 6/4) loamy fine sand, pink (7.5YR 7/4) dry; single grained; loose; common medium roots; medium acid; clear smooth boundary.

A22—45 to 65 inches; light brown (7.5YR 6/4) loamy fine sand, reddish yellow (7.5YR 7/6) dry; common medium distinct mottles of reddish brown (5YR 5/4); single grained; soft, very friable; few fine roots; strongly acid; clear smooth boundary.

B21t—65 to 70 inches; reddish yellow (5YR 6/6) sandy clay loam, reddish yellow (5YR 7/6) dry; common medium distinct mottles of very pale brown; weak fine subangular blocky structure; hard, friable; few fine roots; strongly acid; gradual wavy boundary.

B22t—70 to 80 inches; strong brown (7.5YR 5/6) sandy clay loam, reddish yellow (7.5YR 6/6) dry; common medium distinct mottles of light brownish gray (10YR 6/2) and reddish brown (5YR 5/4); weak fine subangular blocky structure; hard, firm; few fine roots; about 5 percent by volume plinthite; strongly acid.

The thickness of the sandy A horizon is 60 to 75 inches. The A1 horizon is grayish brown, dark grayish brown, yellowish brown, or brown when moist. It is loamy fine sand or fine sand. Reaction is very strongly acid to medium acid. The A2 horizon is pink, light brown, yellowish brown, light yellowish brown, very pale brown, or pinkish gray. It is loamy fine sand or fine sand. Reaction is very strongly acid to medium acid.

The B2t horizon is yellowish brown, reddish yellow, yellowish red, red, or strong brown with mottles of light brownish gray, light gray, strong brown, yellowish brown, reddish brown, reddish yellow, yellowish red, and red. In some pedons, the B2t horizon is reticulately mottled with these colors. Texture is sandy clay loam or sandy clay. Some pedons have siliceous pebbles and black concretions. Reaction is medium acid to very strongly acid. The lower part of the horizon, below a depth of 60 inches, contains 5 to 10 percent plinthite.

Larue series

The Larue series consists of deep, well drained, sandy soils on uplands. They formed in thick, loamy coastal plain sediment. Slope ranges from 3 to 12 percent.

Typical pedon of Larue loamy fine sand in an area of Landman-Larue complex, 3 to 12 percent slopes, in northeast part of Waller County; from junction of Joseph Road and Farm Road 1488, 1 mile west on Farm Road 1488, 1.6 miles northeast along pipeline right-of-way, 0.8 mile northwest along logging road, 50 feet north of road in woodland:

A1—0 to 6 inches; brown (10YR 5/3) loamy fine sand, pale brown (10YR 6/3) dry; single grained; loose; many coarse roots; slightly acid; clear smooth boundary.
A2—6 to 28 inches; light brown (7.5YR 6/4) loamy fine sand, pink (7.5YR 7/4) dry; single grained; loose; many medium roots; medium acid; abrupt smooth boundary.
B21t—28 to 45 inches; yellowish red (5YR 5/8) sandy clay loam, reddish yellow (5YR 6/8) dry; moderate medium subangular blocky structure; hard, friable; few fine roots; patchy clay films; medium acid; gradual wavy boundary.
B22t—45 to 65 inches; yellowish red (5YR 5/6) sandy clay loam, same color when dry; moderate medium subangular blocky structure; hard, friable; few fine roots; patchy clay films; medium acid; gradual smooth boundary.
B23t—65 to 72 inches; yellowish red (5YR 5/6) sandy clay loam; common medium distinct reddish yellow (7.5YR 6/6) mottles; moderate medium subangular blocky structure; hard, friable; medium acid.

The solum is more than 60 inches thick.

The A1 horizon is dark brown, brown, or pale brown when moist. The A2 horizon is brown, light brown, strong brown, or yellowish brown. The A1 and A2 horizons are slightly acid or medium acid.

The B21t horizon is red, yellowish red, or strong brown. Reaction is slightly acid or medium acid.

The B22t horizon is red, yellowish red, reddish yellow, or strong brown. In some pedons, these horizons have brownish and yellowish mottles. Some pedons have a few pockets of clean sand grains below a depth of 60 inches.

Latium series

The Latium series consists of deep, well drained clayey soils on uplands. They formed in weakly consolidated calcareous clay and marl. Slope ranges from 2 to 12 percent.

Typical pedon of Latium clay, 5 to 12 percent slopes, in northwest part of Austin County; from junction of Texas Highway 159 and Farm Road 109, 2 miles west on Highway 159, 0.5 mile south on county road, 500 feet east along private lane, 50 feet north of road in rangeland:

Ap—0 to 4 inches; olive gray (5Y 4/2) clay, dark olive gray (5Y 3/2) dry; weak fine blocky structure; very hard, firm, sticky and plastic; many fine roots; calcareous; moderate alkaline; clear wavy boundary.
AC1—4 to 18 inches; olive (5Y 5/4) clay, olive (5Y 5/4) dry; few streaks of olive gray along old cracks; moderate medium angular blocky structure; very hard, firm, sticky and plastic; common fine roots; slickensides tilted at 45 degrees to horizontal; few fine soft masses of calcium carbonate; moderately alkaline; gradual wavy boundary.
AC2—18 to 42 inches; olive (5Y 5/4) clay, olive (5Y 5/4) dry; few streaks of dark grayish brown; moderate medium angular blocky structure; very hard, very firm, sticky and plastic; few roots; slickensides tilted at 45 degrees to horizontal; common medium soft masses of calcium carbonate; calcareous; moderately alkaline; gradual wavy boundary.
Cca—42 to 60 inches; olive (5Y 5/4) clay, olive (5Y 5/4) dry; common medium distinct light gray (5Y 7/1) mottles; massive; very hard, very firm, sticky and plastic; few slickensides; many coarse soft masses of calcium carbonate; calcareous; moderately alkaline.

The solum is 40 inches to more than 60 inches thick. Texture is clay or silty clay throughout. When dry, the soil has cracks extending to a depth of more than 20 inches. Untilled areas have gilgai microrelief.

The A horizon is very dark grayish brown, very dark gray, dark brown, olive gray, or dark olive gray when dry. The A horizon is less than 12 inches thick in more than 50 percent of the area. A few concretions of calcium carbonate are in some pedons.

The AC horizon is pale olive, olive, olive gray, light olive gray, grayish brown, light olive brown, grayish brown, brown, yellowish brown, or light yellowish brown. Most pedons are mottled with these colors and contain streaks of darker material in old vertical cracks. Intersecting slickensides are common. This horizon has few to common concretions of calcium carbonate.

The Cca horizon is olive or is coarsely mottled in shades of brown, yellow, olive, and gray. It is gray clay or partially weathered marl. This horizon has few to many concretions and soft masses of calcium carbonate.

Lufkin series

The Lufkin series consists of deep, somewhat poorly drained, loamy soils on uplands. They formed in clayey coastal plain sediment. Slope ranges from 0 to 3 percent slopes.

Typical pedon of Lufkin fine sandy loam, 0 to 1 percent slopes, northwest of Hempstead; from intersection of U.S. Highway 290 and Farm Road 1736, 1.3 miles north on Farm Road 1736, 0.4 mile west on county road, 100 feet north of road in pasture:

Ap—0 to 5 inches; grayish brown (10YR 5/2) fine sandy loam, light brownish gray (10YR 6/2) dry; few fine faint dark brown (10YR 4/3) mottles; weak medium subangular blocky structure; very hard, friable; many medium roots and pores; slightly acid; abrupt wavy boundary.
B21tg—5 to 20 inches; dark gray (10YR 4/1) clay, gray (10YR 5/1) dry; common fine distinct yellowish

brown (10YR 5/6) mottles; moderate medium angular blocky structure; extremely hard, firm; few fine roots; prominent clay films; few fine black ferromanganese concretions; few fine siliceous pebbles; slightly acid; gradual smooth boundary.

B22tg—20 to 45 inches; dark gray (10YR 4/1) clay, gray (10YR 5/1) dry; common medium distinct brownish yellow (10YR 6/6) mottles; moderate medium angular blocky structure; extremely hard, firm; few fine roots; prominent clay films; few fine black concretions; few fine siliceous pebbles; moderately alkaline; clear smooth boundary.

IICg—45 to 62 inches; yellowish brown (10YR 5/4) clay loam, light yellowish brown (10YR 6/4) dry; common medium distinct brownish yellow (10YR 6/6) and grayish brown (10YR 5/2) mottles; massive; very hard, firm; few fine black concretions and concretions of calcium carbonate; moderately alkaline.

The solum is 35 to 60 inches thick. Some pedons contain few siliceous pebbles in the upper horizons. When dry, these soils have cracks that are 1 cm or more wide in the upper part of the subsoil.

The A horizon is 10 inches or less thick. It is very dark grayish brown, dark gray, dark grayish brown, grayish brown, light brownish gray, or light gray when moist. The boundary between the A and Bt horizons is abrupt to clear.

The B21tg horizon is dark gray, dark grayish brown, or gray with mottles of yellowish brown, gray, strong brown, and yellowish red. Reaction is medium acid to neutral.

The B22tg horizon is dark gray, gray, grayish brown, or brown with brownish yellow, dark brown, strong brown, and yellowish red mottles. Reaction is strongly acid to moderate alkaline.

The B23tg horizon, where present, is dark gray, dark grayish brown, or gray with mottles of dark grayish brown, dark yellowish brown, and yellowish brown. Reaction is slightly acid to moderately alkaline.

The Cg horizon or IIC horizon is grayish brown, yellowish brown, light brownish gray, or light gray. In some pedons this horizon has mottles of dark grayish brown, grayish brown, or brownish yellow.

Mabank series

The Mabank series consists of deep, somewhat poorly drained, loamy soils on uplands. They formed in thick, unconsolidated clayey coastal plain sediment. Slope ranges from 0 to 3 percent.

Typical pedon of Mabank fine sandy loam, 0 to 1 percent slopes, in southeast part of Austin County; from intersection of Interstate 10 and Farm Road 1458, 1.3 miles north on Farm Road 1458, 1.1 miles east on county road, 100 feet east of road in native grass pasture:

A11—0 to 4 inches; dark grayish brown (10YR 4/2) fine sandy loam, light brownish gray (10YR 6/2) dry; weak fine subangular blocky structure; very hard, friable; many medium roots; slightly acid; abrupt wavy boundary.

A12—4 to 8 inches; very dark gray (10YR 3/1) fine sandy loam, dark gray (10YR 4/1) dry; moderate fine subangular blocky structure; very hard, friable; many medium roots; slightly acid; abrupt smooth boundary.

B21tg—8 to 37 inches; very dark gray (10YR 3/1) clay, dark gray (10YR 4/1) dry; moderate medium blocky structure; very hard, very firm; few fine roots; neutral; clear wavy boundary.

B22tg—37 to 45 inches; dark gray (10YR 4/1) clay, gray (10YR 5/1) dry; moderate medium blocky structure; very hard, very firm; few fine concretions of calcium carbonate; neutral; gradual wavy boundary.

B3t—45 to 62 inches; grayish brown (10YR 5/2) clay, light brownish gray (10YR 6/2) dry; moderate medium blocky structure; very hard, very firm; few streaks of strong brown (7.5YR 5/6); few fine concretions of calcium carbonate; moderately alkaline; clear wavy boundary.

IICca—62 to 73 inches; yellowish red (5YR 5/6) clay, reddish yellow (5YR 6/6) dry; moderate medium blocky structure; very hard, very firm; streaks of grayish brown (10YR 5/2); moderately alkaline.

The solum is 60 to 80 inches thick. In dry periods, cracks 1 cm wide extend from the top of the Bt horizon to a depth of more than 24 inches.

The A horizon is 5 to 11 inches thick; the average thickness is about 7 inches. The A1 or Ap horizon is grayish brown, dark grayish brown, gray, very dark gray, or gray when dry. Reaction is slightly acid to neutral.

The B21tg horizon is dark gray or very dark gray. It is clay loam or clay with 35 to 50 percent clay. Reaction is medium acid to mildly alkaline. The lower part of the B2tg horizon is dark grayish brown, dark gray, gray, light brownish gray, or grayish brown with a few fine mottles in shades of brown, yellow, and gray. Texture is clay or clay loam. Reaction is neutral to moderately alkaline.

The B3t and Cca horizons, where present, are yellowish red, grayish brown, gray, and light brownish gray with mottles in shades of brown, olive, and yellow. Texture is clay or shaly clay. Concretions of calcium carbonate, iron, and gypsum are present in some pedons. Reaction is neutral to moderately alkaline.

A IIC horizon is present below a depth of 60 inches in some pedons.

The soil in map unit MaB has higher chroma in the lower horizons than is typical for the Mabank series. Use and management are similar.

Midland series

The Midland series consists of deep, poorly drained, loamy soils on uplands. They formed in thick, unconsolidated, clayey coastal plain sediment. Slope ranges from 0 to 3 percent.

Typical pedon of Midland clay loam, 0 to 1 percent slopes, in the south part of Waller County; from junction of Farm Road 359 and Farm Road 529, 2.4 miles east on Farm Road 529, 1.0 mile south on county road, 100 feet east of road in cropland:

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) clay loam, light brownish gray (10YR 6/2) dry; weak fine subangular blocky structure; hard, firm; many fine roots; slightly acid; abrupt smooth boundary.

B21tg—6 to 31 inches; dark gray (10YR 4/1) clay, light gray (10YR 6/1) dry; common medium faint mottles of dark yellowish brown (10YR 4/4); moderate medium angular blocky structure; very hard, very firm; few fine roots; slightly acid; clear wavy boundary.

B22tg—31 to 40 inches; dark gray (10YR 4/1) clay, gray (10YR 5/1) dry; moderate medium angular blocky structure; very hard, very firm; few fine roots; neutral; gradual wavy boundary.

B23tg—40 to 54 inches; dark gray (10YR 4/1) clay, light gray (10YR 6/1) dry; moderate medium angular blocky structure; very hard, very firm; few fine concretions of calcium carbonate; moderately alkaline; clear wavy boundary.

B3tg—54 to 66 inches; grayish brown (10YR 5/2) clay, light gray (10YR 7/2) dry; weak medium subangular blocky structure; very hard, very firm; streaks of dark grayish brown (10YR 4/2); many medium concretions of calcium carbonate, soft calcium carbonate accumulations; moderately alkaline; clear wavy boundary.

C—66 to 72 inches; light brownish gray (10YR 6/2) clay, white (10YR 8/2) dry; massive; hard, firm; many medium concretions of calcium carbonate; moderately alkaline.

The solum is 60 to 80 inches thick.

The Ap horizon is less than 10 inches thick. The Ap horizon is dark grayish brown, dark gray, gray, or light gray when dry.

The B21tg horizon is dark gray, very dark gray, light brownish gray or dark grayish brown with few to common mottles in shades of dark yellowish brown, light olive brown, yellowish brown, and brown. Clay content is 35 to 50 percent. Reaction ranges from medium acid to slightly acid.

The B22tg horizon is very dark grayish brown, grayish brown, dark gray, grayish brown, gray, or very dark gray. Mottles of brown or light olive brown are in some pedons. Clay content is 40 to 50 percent. Reaction ranges from slightly acid to mildly alkaline.

Clay content of the B3 and C horizons ranges from 35 to 55 percent. Reaction is mildly alkaline to moderately alkaline. There are few to many concretions and soft lumps of calcium carbonate.

Monaville series

The Monaville series consists of deep, moderately well drained, sandy soils on uplands. They formed in thick, unconsolidated, loamy and sandy coastal plain sediment. Slope ranges from 1 to 5 percent.

Typical pedon of Monaville loamy fine sand, 1 to 5 percent slopes, in east part of Waller County; from intersection of U.S. Highway 290 and Farm Road 362, 2 miles south on Farm Road 362, 0.1 mile west on county road, 100 feet north of road in native meadow:

A1—0 to 15 inches; brown (10YR 4/3) loamy fine sand, pale brown (10YR 6/3) dry; weak fine subangular blocky structure; soft, very friable; many fine and medium roots; strongly acid; clear wavy boundary.

A2—15 to 28 inches; yellowish brown (10YR 5/4) loamy fine sand, very pale brown (10YR 7/4) dry; single grained; soft, very friable; many fine and medium roots; strongly acid; clear smooth boundary.

B21t—28 to 34 inches; light yellowish brown (10YR 6/4) sandy clay loam; moderate medium subangular blocky structure; slightly hard, friable; few fine roots; strongly acid; gradual wavy boundary.

B22t—34 to 41 inches; pale brown (10YR 6/3) sandy clay loam; common medium distinct mottles of red (2.5YR 4/6) and strong brown (7.5YR 5/8); moderate medium subangular blocky structure; hard, friable; few fine roots; about 8 percent plinthite nodules; strongly acid; gradual wavy boundary.

B23t—41 to 54 inches; dark grayish brown (10YR 4/2) sandy clay loam; many medium prominent dark red (2.5YR 3/6) and brownish yellow (10YR 6/8) mottles; moderate medium subangular blocky structure; hard, friable; about 10 percent plinthite nodules; strongly acid; gradual wavy boundary.

B24t—54 to 74 inches; yellowish brown (10YR 5/8) sandy clay loam; many coarse distinct dark red (2.5YR 3/6) and light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; hard, firm; about 10 percent plinthite nodules; strongly acid.

The solum is 60 to 80 inches thick. Depth to a horizon containing 5 to 20 percent plinthite ranges from 22 to 40 inches. Abundance of ironstone nodules ranges from none to common.

The A horizon is 20 to 35 inches thick. The Ap or A1 horizon is pinkish white, pinkish gray, pale brown, or brown when dry. The A2 horizon is pink, yellowish brown, very pale brown, or light brownish gray.

The B21t horizon is yellowish brown, light yellowish brown, dark yellowish brown, or strong brown. Clay content is 20 to 35 percent. Reaction is strongly acid to very strongly acid.

The B22t horizon is faintly to distinctly mottled in shades of yellowish red, red, and light brownish gray. Clay content is 25 to 35 percent clay. Reaction is strongly acid to very strongly acid.

Nahatche series

The Nahatche series consists of deep, somewhat poorly drained, loamy soils on flood plains along local creeks and drainageways. These soils formed in loamy alluvium. Slope ranges from 0 to 1 percent.

Typical pedon of Nahatche loam, frequently flooded, southeast of Hempstead; from intersection of U.S. Highway 290 and Farm Road 359, 2.3 miles south on Farm Road 359, 2.1 miles west and north on county road, 100 feet north of road in wooded creek bottom:

A1—0 to 8 inches; grayish brown (10YR 5/2) loam; common fine distinct light yellowish brown mottles; weak fine subangular blocky structure; hard, friable; many coarse roots; medium acid; clear smooth boundary.

C1g—8 to 31 inches; grayish brown (10YR 5/2) fine sandy loam; common medium distinct light yellowish brown (10YR 6/4) mottles; weak medium subangular blocky structure; hard, friable; common fine roots; common strata of loamy fine sand and clay loam; medium acid; abrupt smooth boundary.

C2g—31 to 62 inches; gray (10YR 5/1) loam; common coarse distinct dark yellowish brown (10YR 4/4) mottles; weak fine subangular blocky structure; hard, friable; common fine roots; fine strata of fine sandy loam and clay loam; medium acid.

These soils are strongly acid to mildly alkaline throughout.

The A1 horizon is 5 to 15 inches thick. When dry, it is grayish brown, brown, yellowish brown, dark grayish brown, or pale brown with common fine and medium mottles of light yellowish brown or yellowish brown.

The C1g horizon is grayish brown or gray mottled with brownish yellow, light yellowish brown, yellowish brown, light brownish gray, grayish brown, or brown. This horizon is stratified loam, clay loam, fine sandy loam, and loamy fine sand.

The C2g horizon is gray, light gray, brown, or grayish brown with common mottles of dark yellowish brown or yellowish brown. Texture is clay loam, loam, or fine sandy loam.

Newulm series

The Newulm series consists of deep, moderately well drained, sandy soils on uplands. They formed in loamy and sandy unconsolidated coastal plain sediment. Slope ranges from 1 to 8 percent.

Typical pedon of Newulm loamy fine sand, 1 to 5 percent slopes (fig. 13), east of New Ulm; from intersection of Farm Road 949 and Farm Road 1094, 2.6 miles northwest on Farm Road 1094, 1.3 miles north on private road, 50 feet east of road in rangeland:

A1—0 to 4 inches; light yellowish brown (10YR 6/4) loamy sand, very pale brown (10YR 7/4) dry; single grained; loose, very friable; many fine and medium roots; slightly acid; clear smooth boundary.

A2—4 to 22 inches; very pale brown (10YR 7/4) loamy sand, very pale brown (10YR 7/4) dry; single grained; loose; many fine roots; very strongly acid; abrupt smooth boundary.

B21t—22 to 31 inches; red (2.5YR 4/6) sandy clay loam, red (2.5YR 4/6) dry; common medium distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; hard, friable; common fine roots; common thin clay films; few plinthite nodules; base saturation 29 percent by field kit; very strongly acid; gradual smooth boundary.

B3—31 to 80 inches; dark red (2.5YR 3/6) weakly cemented sandstone and sandy clay loam, dark red (2.5YR 3/6) dry; common medium distinct light gray (N 7/0) mottles; massive; very hard, friable; few fine roots penetrating gray areas; base saturation 15 percent by field kit; very strongly acid.

The solum is 60 to 80 inches thick.

The A horizon is 20 to 40 inches thick. The A1 horizon is very pale brown, light yellowish brown, light gray, or light brownish gray when dry. The A2 horizon is very pale brown or white. Reaction is slightly acid to very strongly acid. The boundary between the A and B21t horizons is abrupt to clear.

The B21t horizon is mottled in shades of red, strong brown, light yellowish brown, and gray. Clay content is 20 to 34 percent. Reaction ranges from very strongly acid to medium acid.

The B3 horizon is dark red or red with light gray and light yellowish brown mottles. Reaction is very strongly acid to medium acid.

Norwood series

The Norwood series consists of deep, well drained, loamy soils on flood plains. They formed in recent loamy alluvium deposited by the Brazos River. Slope is 0 to 1 percent.

Typical pedon of Norwood silty clay loam, 0 to 1 percent slopes, in northwest part of Waller County; from junction of Texas Highway 6 and Farm Road 1736, 1.4 miles west on Farm Road 1736, 1.6 miles north on county road, 1.6 miles north through private pasture to working pens, 600 feet west of pens in hayfield:

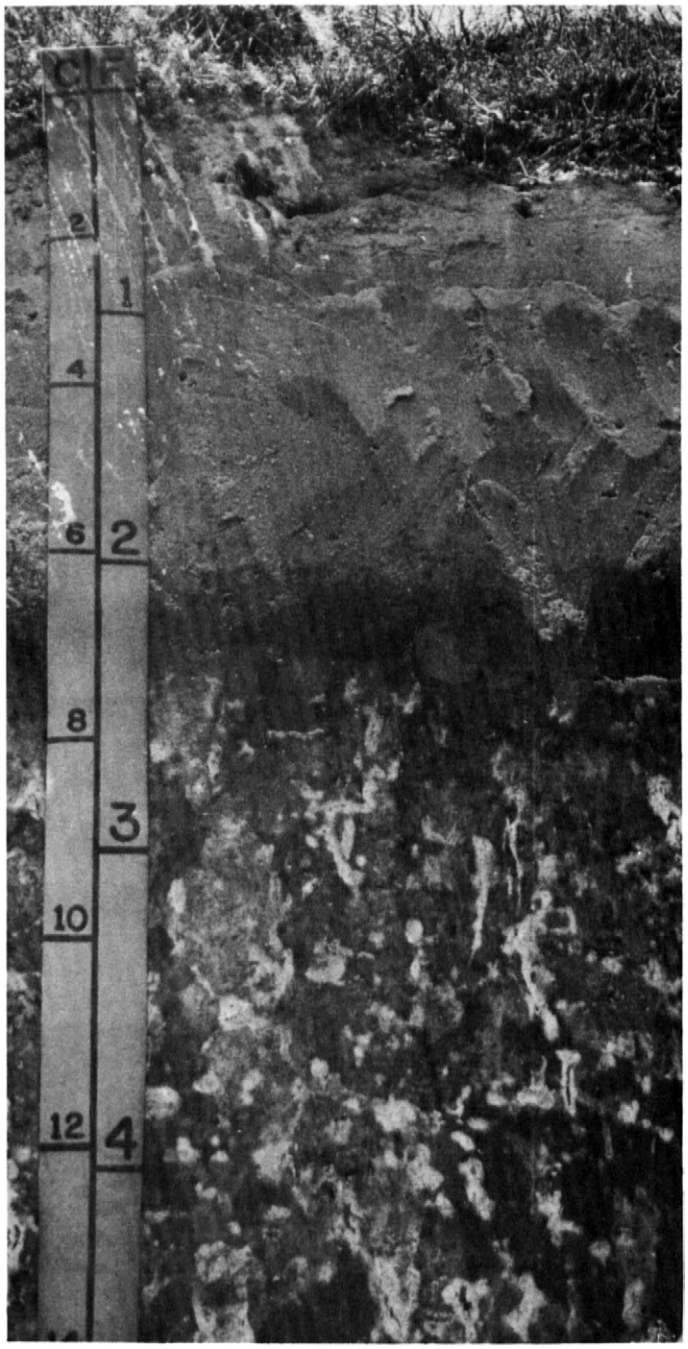


Figure 13.—Profile of Newulm loamy fine sand, which has a sandy surface layer and a mottled subsoil of sandy clay loam. Scale in decimeters and feet.

Ap—0 to 12 inches; reddish brown (5YR 4/3) silty clay loam, reddish brown (5YR 5/3) dry; weak fine granular blocky structure; hard, friable; many medium roots; common worm casts; calcareous; moderately alkaline; clear smooth boundary.

A12—12 to 16 inches; reddish brown (5YR 4/3) silty clay loam, reddish brown (5YR 5/3) dry; weak medium subangular blocky structure; hard, friable; many fine roots; common worm casts; calcareous; moderately alkaline; clear wavy boundary.

C1—16 to 36 inches; reddish brown (5YR 4/3) silt loam, reddish brown (5YR 5/3) dry; massive; slightly hard, friable; few fine roots; few bedding planes; calcareous; moderately alkaline; clear wavy boundary.

IIC2—36 to 52 inches; reddish brown (5YR 5/4) very fine sandy loam, light reddish brown (5YR 6/4) dry; massive; few fine roots; common bedding planes; calcareous; moderately alkaline; gradual wavy boundary.

IIIC3—52 to 62 inches; dark reddish brown (5YR 3/2) clay, dark reddish gray (5YR 4/2) dry; massive; common bedding planes; calcareous; moderately alkaline; clear smooth boundary.

IIIC4—62 to 72 inches; dark reddish brown (5YR 3/3) clay, reddish brown (5YR 4/3) dry; massive; common bedding planes; calcareous; moderately alkaline.

Depth to bedding planes ranges from a few inches to 30 inches.

The A horizon is reddish brown or dark brown when dry. It is silty clay loam or silt loam.

The B horizon, where present, is reddish brown, brown, or yellowish red. It is silty clay loam or silt loam.

The C horizon is reddish brown, dark reddish brown, brown, or yellowish red. It is silt loam, silty clay, clay, clay loam, loam, or silty clay loam and in most pedons is thinly stratified with these textures.

Oklared series

The Oklared series consists of deep, well drained, loamy soils on flood plains of the Brazos River. They formed in recent loamy alluvium. Slope is 0 to 1 percent.

Typical pedon of Oklared very fine sandy loam, 0 to 1 percent slopes (fig. 14), northwest of Hempstead; from junction of Texas Highway 6 and Farm Road 1736 north of Hempstead, 2.4 miles west on Farm Road 1736, 2.4 miles north on private road, 1,000 feet northwest in native pasture:

A1—0 to 8 inches; brown (7.5YR 5/4) very fine sandy loam, light brown (7.5YR 6/4) dry; weak fine subangular blocky structure; soft, very friable; many medium roots; calcareous; moderately alkaline; clear smooth boundary.

C1—8 to 55 inches; light brown (7.5YR 6/4) fine sandy loam, pink (7.5YR 7/4) dry; massive; soft, very friable; many bedding planes; calcareous; moderately alkaline; clear smooth boundary.

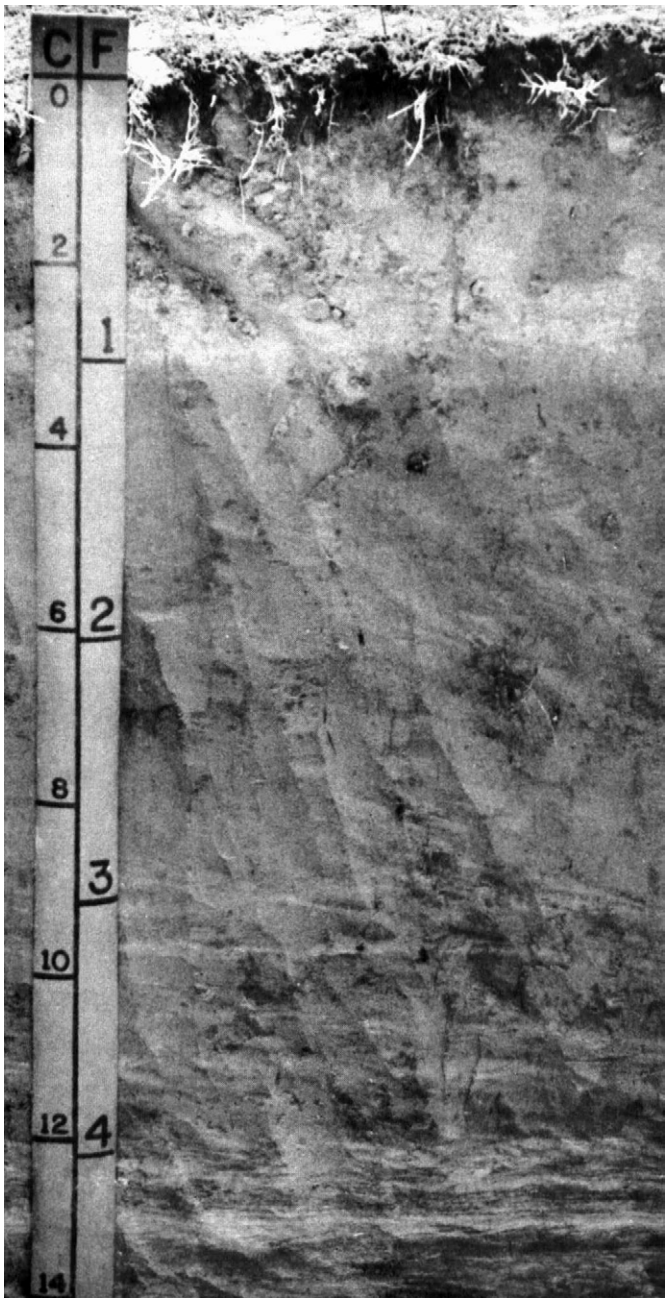


Figure 14.—Profile of Oklared very fine sandy loam, which is stratified in the lower part. Scale in decimeters and feet.

C2—55 to 70 inches; reddish brown (5YR 5/4) silt loam, light reddish brown (5YR 6/4) dry; massive; slightly hard, friable; many bedding planes and few thin strata of fine sandy loam and loamy fine sand; calcareous; moderately alkaline.

Some pedons are noncalcareous in the upper 10 inches.

The A horizon is light brown, brown, yellowish red, dark reddish gray, or reddish brown when moist. It is fine sandy loam or very fine sandy loam. Some pedons have thin layers of silt loam.

The C horizon is light brown, brown, reddish brown, yellowish red, or reddish yellow. It is fine sandy loam, silt loam, or very fine sandy loam. Some pedons contain thin strata of loamy fine sand, silt loam, or silty clay loam; however, the average clay content of the C horizon is less than 18 percent.

Rader series

The Rader series consists of deep, moderately well drained, loamy soils on uplands on ancient stream terraces. They formed in loamy and clayey alluvium. Slope ranges from 1 to 3 percent but is dominantly less than 1 percent.

Typical pedon of Rader fine sandy loam, 0 to 1 percent slopes, southwest of Hempstead; from junction of U.S. Highway 290 and Texas Highway 159 in Hempstead, 2.7 miles west and south on Texas Highway 159, 0.2 mile west on county road, 1,000 feet north of road in native pasture:

A1—0 to 6 inches; grayish brown (10YR 5/2) fine sandy loam, light brownish gray (10YR 6/2) dry; many black stains and reddish brown mottles; weak fine subangular blocky structure; hard, firm; many roots; slightly acid; clear wavy boundary.

A2—6 to 15 inches; pale brown (10YR 6/3) fine sandy loam, very pale brown (10YR 7/3) dry; many black stains and reddish mottles; weak fine subangular blocky structure; hard, friable; many roots; slightly acid; gradual wavy boundary.

B&A—15 to 23 inches; light yellowish brown (10YR 6/4) sandy clay loam; common medium distinct mottles and ped coatings of light gray (10YR 7/2); few reddish brown mottles; moderate medium subangular blocky structure; very hard, firm; many roots; slightly acid; gradual wavy boundary.

B21t—23 to 40 inches; light gray (10YR 7/2) sandy clay; common medium distinct yellowish red (5YR 5/6) and yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; extremely hard, very firm; prominent clay films; strongly acid; gradual wavy boundary.

B22t—40 to 65 inches; light gray (10YR 7/2) sandy clay; common medium distinct mottles of yellowish brown (10YR 5/6) and yellowish red (5YR 5/6); moderate medium subangular blocky structure; extremely hard, very firm; strongly acid.

The solum is 60 inches to over 100 inches thick. The A horizon is 15 to 25 inches thick. The A1 horizon when dry is brown, light brownish gray, or pale brown. The A2 horizon when dry is pinkish gray, pink, light brownish

gray, pale brown, or very pale with or without dark brown or strong brown mottles. The boundary between the A and B horizons is clear to gradual.

The B&A horizon is yellowish brown or light yellowish brown with grayish brown, light brownish gray, light gray, and strong brown mottles. Reaction is strongly acid to medium acid.

The B21t horizon is light gray, brown, or grayish brown mottled in shades of light gray, yellowish red, yellowish brown, strong brown, grayish brown, and red. Texture is clay loam or clay. Reaction is strongly acid to slightly acid.

The B22t horizon is light gray mottled in shades of light gray, yellowish brown, yellowish red, grayish brown, dark gray, strong brown, and dark grayish brown. It is sandy clay or clay with 40 to 55 percent clay. Reaction ranges from strongly acid to slightly acid.

Renish series

The Renish series consists of shallow, well drained, loamy soils on uplands. They formed in strongly cemented calcareous sandstone. Slope ranges from 5 to 20 percent.

Typical pedon of Renish clay loam, 5 to 20 percent slopes, in northwest part of Austin County; from intersection of Farm Road 2754 and Farm Road 2502, 0.9 mile north on Farm Road 2502, 2.2 miles east on Weicker Road, 200 feet north of road in pasture:

A1—0 to 12 inches; very dark grayish brown (10YR 3/2) clay loam, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; hard, firm; many roots and pores; calcareous; about 10 percent by volume small sandstone fragments; moderately alkaline; clear boundary.

AC—12 to 15 inches; very dark grayish brown (10YR 3/2) clay loam, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; hard, firm; many roots; calcareous; about 40 percent sandstone fragments; moderately alkaline; abrupt boundary.

R—15 to 30 inches; indurated, calcareous sandstone that is coarsely fractured.

The solum is 12 to 18 inches thick. The A horizon contains 10 to 20 percent calcareous sandstone fragments.

The A and AC horizons are very dark grayish brown, very dark gray, or very dark brown when dry. The AC horizon may not be present in pedons that are less than 12 inches thick over sandstone.

The R layer is whitish or brownish, indurated, calcareous sandstone. Some pedons contain thin layers of softer material.

Sealy series

The Sealy series consists of deep, poorly drained, sandy soils on uplands. They formed in thick sandy and loamy coastal plain sediment. Slope ranges from 0 to 5 percent.

Typical pedon of Sealy loamy fine sand, 0 to 5 percent slopes, in north part of Austin County; from junction of Texas Highway 159 and Farm Road 1456 in downtown Bellville, 2.9 miles north on Farm Road 1456, 1.5 miles west and north on county road, 100 feet east of road in pasture:

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) loamy fine sand, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many medium roots; very strongly acid; clear smooth boundary.

A21g—6 to 18 inches; grayish brown (10YR 5/2) loamy fine sand, light brownish gray (10YR 6/2) dry; single grained; loose, nonsticky and nonplastic; many fine roots; very strongly acid; clear wavy boundary.

A22g—18 to 48 inches; gray (10YR 6/1) loamy fine sand, white (10YR 8/1) dry; single grained; loose, nonsticky and nonplastic; few fine roots; very strongly acid; abrupt wavy boundary.

B21tg—48 to 62 inches; light gray (10YR 7/1) sandy clay loam, white (10YR 8/1) dry; common medium distinct brownish yellow (10YR 6/6) mottles; moderate medium subangular blocky structure; firm, sticky and plastic; few fine roots; thin patchy clay films; very strongly acid; gradual wavy boundary.

B22tg—62 to 72 inches; light gray (N 7/0) sandy clay loam, white (N 8/0) dry; common medium distinct brownish yellow (10YR 6/6) and dark reddish brown (5YR 5/4) mottles; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few clay films; about 2 percent nodules of plinthite; very strongly acid.

The solum is more than 80 inches thick.

The sandy A horizon is 40 to 80 inches thick. The A1 or Ap horizon is dark grayish brown, grayish brown, brown, or light brownish gray when moist. Reaction is medium acid to very strongly acid. The A2 horizon is gray, light gray, grayish brown, or light brownish gray. Texture is loamy fine sand, fine sand, or loamy sand. Reaction is medium acid to very strongly acid.

The B2t horizon is light gray or light brownish gray with mottles of brownish yellow, yellowish brown, dark reddish brown, and red. Texture is sandy clay loam, loam, or clay loam with 25 to 35 percent clay. Reaction is medium acid to very strongly acid.

Segno series

The Segno series consists of deep, moderately well drained, loamy soils on uplands. They formed in thick, unconsolidated, loamy coastal plain sediment. Slope ranges from 1 to 5 percent.

Typical pedon of Segno fine sandy loam, 1 to 5 percent slopes, in northeast part of Waller County approximately 8.0 miles southeast of junction of Farm Road 1488 and Farm Road 362; from Spring Creek bridge, 1.2 miles north on Murrell Road, 100 feet east of road:

A11—0 to 5 inches; grayish brown (10YR 5/2) fine sandy loam, light brownish gray (10YR 6/2) dry; weak medium subangular blocky structure; slightly hard, friable; many roots; strongly acid; abrupt smooth boundary.

A12—5 to 10 inches; dark grayish brown (10YR 4/2) fine sandy loam, light brownish gray (10YR 6/2) dry; weak medium subangular blocky structure; slightly hard, friable, many roots; strongly acid; clear smooth boundary.

A2—10 to 15 inches; brown (10YR 5/3) fine sandy loam, pale brown (10YR 6/3) dry; weak medium subangular blocky structure; slightly hard, friable; many roots; strongly acid; clear smooth boundary.

B21t—15 to 22 inches; yellowish brown (10YR 5/6) sandy clay loam, brownish yellow (10YR 6/6) dry; weak medium subangular blocky structure; hard, friable; few roots; strongly acid; clear smooth boundary.

B22t—22 to 36 inches; yellow (10YR 7/6) sandy clay loam, yellow (10YR 7/8) dry; weak medium subangular blocky structure; hard, friable; few roots; few plinthite masses and red mottles; strongly acid; gradual smooth boundary.

B23t—36 to 68 inches; brownish yellow (10YR 6/6) sandy clay loam, yellow (10YR 7/6) dry; common medium distinct yellowish red (5YR 5/8) mottles and few fine distinct grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; hard, friable; about 20 percent plinthite and common red mottles; strongly acid; gradual smooth boundary.

B24t—68 to 72 inches; reticulately mottled light gray (10YR 7/2), brownish yellow (10YR 6/6), and red (2.5YR 4/8) sandy clay loam; weak medium subangular blocky structure; very hard, firm; strongly acid.

The solum is more than 60 inches thick.

The A horizon is 11 to 18 inches thick. The A1 horizon is dark grayish brown, grayish brown, dark brown, or brown when moist. The A2 horizon is pale brown, light yellowish brown, light brown, or brown. Reaction ranges from strongly acid to slightly acid. The boundary is abrupt to gradual.

The B21t horizon is brownish yellow, yellowish brown, or reddish yellow and in places has faint mottles of yellowish brown and yellowish red. Texture is sandy clay loam or clay loam with 25 to 35 percent clay. Reaction is very strongly acid to medium acid. A few ironstone nodules are present in some pedons. The boundary is abrupt to gradual.

The B22t horizon is yellow, yellowish brown, or strong brown and generally is mottled with yellowish brown, brownish yellow, yellow, light brownish gray, reddish yellow, or red. Texture is sandy clay to sandy clay loam with 28 to 35 percent clay. It is 5 to 15 percent ironstone nodules and plinthite masses. Reaction is strongly acid to medium acid. The boundary is clear to gradual.

The B23t and B24t horizons are mottled with reddish yellow, yellowish brown, gray, brownish yellow, dark red, or yellowish red. Texture is sandy clay loam, silty clay loam, or clay loam with 28 to 35 percent clay. The B23t horizon has 5 to 20 percent plinthite nodules. Reaction is strongly acid to medium acid. The boundary is clear to gradual.

Silawa series

The Silawa series consists of deep, well drained, sandy soils on ancient terraces of the Brazos River on uplands. They formed in loamy alluvium. Slope ranges from 1 to 8 percent.

Typical pedon of Silawa loamy fine sand, 5 to 8 percent slopes, southwest of Hempstead; from junction of U.S. Highway 290 and Texas Highway 159 in Hempstead, 0.8 mile west on Austin Street, 0.4 mile south on county road, 2.6 miles southwest on county road, 0.5 mile south on private road, along a ridge 800 feet north of property line fence and 600 feet east of Perry Lake:

Ap—0 to 12 inches; brown (10YR 5/3) loamy fine sand, pale brown (10YR 6/3) moist; weak fine subangular blocky structure; soft, friable; many fine roots and pores; slightly acid; clear wavy boundary.

B21t—12 to 20 inches; yellowish red (5YR 4/6) sandy clay loam, yellowish red (5YR 5/6) dry; few fine faint mottles of reddish yellow (7.5YR 6/6); moderate medium subangular blocky structure; hard, friable; many fine roots; very strongly acid; clear smooth boundary.

B22t—20 to 40 inches; yellowish red (5YR 5/6) sandy clay loam, reddish yellow (5YR 6/6) dry; moderate medium subangular blocky structure; hard, firm; common fine roots; common clay films on peds; strongly acid; clear smooth boundary.

B23t—40 to 55 inches; yellowish red (10YR 5/6) sandy clay loam, reddish yellow (5YR 6/6) dry; weak medium subangular blocky structure; hard, friable; few fine roots; few patchy clay films; strongly acid; clear smooth boundary.

B31—55 to 70 inches; yellowish red (5YR 5/8) fine sandy loam, reddish yellow (5YR 6/8) dry; weak medium subangular blocky structure; slightly hard, friable; few skeletans; medium acid; clear wavy boundary.
B32—70 to 80 inches; yellowish red (5YR 5/8) fine sandy loam, reddish yellow (5YR 6/8) dry; weak medium subangular blocky structure; soft, friable; medium acid.

The solum is 40 to more than 80 inches thick.

The A horizon is 10 to 18 inches thick. This horizon is brown, dark brown, pale brown, pinkish gray, grayish brown, or brown when dry. Some pedons have a few siliceous pebbles. Reaction is strongly acid to slightly acid.

The B2t horizon is yellowish red or red. Texture is sandy clay loam or clay loam. Some pedons have a few siliceous pebbles. This horizon is very strongly acid to slightly acid. The B3t horizon is reddish yellow or yellowish red fine sandy loam or sandy clay loam. It is slightly acid to medium acid.

The C horizon, where present, is stratified fine sandy loam or loamy fine sand. It is slightly acid to neutral.

Splendora series

The Splendora series consists of deep, somewhat poory drained, loamy soils on uplands. They formed in thick, loamy, unconsolidated coastal plain sediment. Slope ranges from 0 to 3 percent.

Typical pedon of Splendora fine sandy loam, 0 to 3 percent slopes, in northeast part of Waller County; from junction of Joseph Road and Farm Road 1488, southwest on Joseph Road to intersection with Kimbro Road, 0.4 mile east on Kimbro Road, 50 feet south of road in woodland:

A1—0 to 3 inches; light brownish gray (10YR 6/2) fine sandy loam, light gray (10YR 7/2) dry; weak fine subangular blocky structure; hard, firm; many medium roots; strongly acid; abrupt wavy boundary.
A2—3 to 13 inches; pale brown (10YR 6/3) fine sandy loam, very pale brown (10YR 7/3) dry; weak fine subangular blocky structure; hard, firm; common medium roots; medium acid; gradual wavy boundary.
A2g&B21t—13 to 20 inches; grayish brown (10YR 5/2) sandy clay loam, light brownish gray (10YR 6/2) dry; common medium distinct mottles of yellowish brown (10YR 5/6); about 50 percent by volume tongues (mostly A2g) of very pale brown (10YR 7/3) fine sandy loam that are essentially stripped of clay and that extend into horizons above and below; weak fine subangular blocky structure; hard, firm; few fine roots; strongly acid; gradual irregular boundary.
B22tg—20 to 36 inches; grayish brown (10YR 5/2) sandy clay loam, light brownish gray (10YR 6/2) dry; common medium distinct mottles of yellowish brown (10YR 5/4); weak fine subangular blocky structure; hard, firm; few tongues of fine sandy loam; strongly acid; gradual wavy boundary.
B23tg—36 to 60 inches; light gray (10YR 7/2) sandy clay loam, white (10YR 8/2) dry; common medium distinct mottles of strong brown (7.5YR 5/6); weak fine subangular blocky structure; hard, firm; few tongues of fine sandy loam in upper part increasing in size in lower part; few fine plinthite masses; strongly acid.

The solum is more than 60 inches thick.

The A horizon is 10 to 20 inches thick. The A1 horizon is light brownish gray, grayish brown, light yellowish brown, or light gray when dry. The A2 horizon is pale brown, very pale brown, or pink.

The B21tg horizon is grayish brown or light brownish gray and is usually mottled in shades of grayish brown, light brownish gray, yellowish brown, strong brown, and pale brown. Texture is sandy clay loam with 18 to 28 percent clay. Reaction is very strongly acid to moderately alkaline.

The B22tg and B23tg horizons are grayish brown and light brownish gray and are prominently to distinctly mottled in shades of yellowish brown, grayish brown, light brownish gray, strong brown, pale brown, and reddish yellow. These horizons are sandy clay loam or clay. Reaction ranges from very strongly acid to moderately alkaline.

Straber series

The Straber series consists of deep, moderately well drained, sandy soils on uplands. They formed in thick, unconsolidated coastal plain sediment. Slope ranges from 1 to 8 percent.

Typical pedon of Straber loamy fine sand, 1 to 5 percent slopes, in central Austin County; from junction of Texas Highway 36 and Old Kenney Road, 0.9 mile northwest on Old Kenney Road, 0.6 mile west on gravel road, 350 feet southeast of road in pasture:

A1—0 to 3 inches; light brownish gray (10YR 6/2) loamy fine sand, grayish brown (10YR 5/2) dry; single grained; loose, nonsticky and nonplastic; common roots; slightly acid; clear boundary.
A2—3 to 16 inches; light gray (10YR 7/2) loamy fine sand, white (10YR 8/2) dry; common medium distinct very pale brown (10YR 7/4) mottles; single grained; loose, nonsticky and nonplastic; many roots; slightly acid; abrupt boundary.
B21t—16 to 32 inches; red (2.5YR 5/6) clay, light red (2.5YR 6/6) dry; common medium prominent red (2.5YR 4/6) and light gray (10YR 7/1) mottles; medium moderate blocky structure; extremely hard, very firm, very sticky and very plastic; few roots; few clay films; very strongly acid; gradual boundary.

B22t—32 to 45 inches; yellowish brown (10YR 5/6) clay, brownish yellow (10YR 6/6) dry; common medium prominent red (2.5YR 4/6) and light gray (10YR 7/1) mottles; weak moderate blocky structure; extremely hard, very firm, very sticky and very plastic; few roots; few clay films; very strongly acid; gradual boundary.

B23t—45 to 65 inches; light gray (10YR 7/1) clay, white (10YR 8/1) dry; common medium prominent red (2.5YR 4/6) and brownish yellow (10YR 6/6) mottles; weak moderate blocky structure; extremely hard, very firm, very sticky and very plastic; few clay films; strongly acid; gradual boundary.

B24t—65 to 75 inches; light brownish gray (10YR 6/2) clay, light gray (10YR 7/2) dry; common medium prominent red (2.5YR 4/6) and brownish yellow (10YR 6/6) mottles; weak moderate blocky structure; extremely hard, very firm, very sticky and very plastic; medium acid.

The solum is 40 to 70 inches thick. A few siliceous pebbles are throughout the solum in some pedons.

The A horizon is 10 to 20 thick. The Ap or A1 horizon when dry is light brownish gray, brown, pale brown, very pale brown, or light gray. The A2 horizon has similar colors but is generally 1 in value lighter. Reaction is slightly acid to medium acid.

The B2t horizon is light gray, brown, light brownish gray, pale brown, light yellowish brown, yellowish brown, or brownish yellow with mottles in shades of red, brown, yellow, and gray. Texture is clay or sandy clay. Reaction is strongly acid or very strongly acid.

The B3 and C horizons, where present, are light gray, light yellowish brown, or yellowish brown and mottled in shades of red, yellow, olive, and gray. Texture is clay or clay loam. Some pedons have a few concretions of calcium carbonate. Reaction is medium acid to mildly alkaline.

Styx series

The Styx series consists of deep, well drained, sandy soils on uplands on ancient stream terraces. They formed in sandy and loamy alluvium. Slope ranges from 1 to 5 percent.

Typical pedon of Styx loamy fine sand, 1 to 5 percent slopes, south of Hempstead; from junction of Texas Highway 159 and Farm Road 1887 in Hempstead, 2.2 miles south on Farm Road 1887, 0.3 mile east on county road to end of road, 700 feet east in pasture:

Ap—0 to 10 inches; yellowish brown (10YR 5/4) loamy fine sand, light yellowish brown (10YR 6/4) dry; single grained; loose; many fine roots; strongly acid; clear smooth boundary.

A2—10 to 22 inches; very pale brown (10YR 7/4) loamy fine sand, very pale brown (10YR 7/4) dry; single grained; slightly hard, very friable; common fine roots; strongly acid; clear smooth boundary.

B21t—22 to 28 inches; yellowish brown (10YR 5/6) sandy clay loam, brownish yellow (10YR 6/6) dry; moderate medium subangular blocky structure; very hard, friable; few fine roots; few patchy clay films; strongly acid; clear smooth boundary.

B22t—28 to 38 inches; yellowish brown (10YR 5/6) sandy clay loam, brownish yellow (10YR 6/6) dry; common medium prominent red (2.5YR 4/8) mottles; moderate medium subangular blocky structure; very hard, friable; few fine roots; few patchy clay films; strongly acid; gradual smooth boundary.

B23t—38 to 48 inches; mottled red (2.5YR 4/8), yellowish brown (10YR 5/8), and light brownish gray (2.5Y 6/2) sandy clay loam; weak medium subangular blocky; very hard, friable; few patchy clay films; strongly acid; gradual smooth boundary.

B3t—48 to 80 inches; red (2.5YR 4/8) sandy clay loam, red (2.5YR 4/8) moist; weak medium subangular blocky structure; very hard, friable; strongly acid.

The A horizon is 20 to 40 inches thick. The A1 horizon when dry is yellowish brown, brown, light brownish gray, pale brown, grayish brown, dark grayish brown, or light yellowish brown. Reaction is strongly acid to slightly acid. The A2 horizon is brown, pale brown, light yellowish brown, yellowish brown, or light brown. It is loamy fine sand or fine sand. Reaction is strongly acid to slightly acid.

The B2t horizon is sandy clay loam or clay loam. The clay content in the upper 20 inches is 20 to 35 percent. The B21t and B22t horizons are yellowish brown, brownish yellow, or reddish yellow and may be distinctly and prominently mottled with gray, light brownish gray, yellowish red, brownish yellow, dark red, red, brown, or yellowish brown. The B3t horizon is red or yellowish red and is mottled in shades of red, gray, or brown. The Bt horizon is slightly acid to very strongly acid throughout.

This soil is a taxadjunct to the Styx series because colors are redder in the B3 horizon than is typical for the Styx series. However, use and management are similar.

Sumpf series

The Sumpf series consists of deep, very poorly drained, clayey soils on flood plains in oxbow channels that were previously the stream channel of the Brazos River. These soils formed in clayey and loamy alluvium. Slope is 0 to 1 percent.

Typical pedon of Sumpf clay, frequently flooded, in west part of Waller County; from intersection of Farm Road 1458 and Farm Road 3318 west of Pattison, 2.1 miles north on Farm Road 3318, 2.7 miles north on county road, 0.6 mile west along pasture road, 500 feet northwest of end of road:

A11—0 to 15 inches; dark brown (7.5YR 3.2) clay, brown (7.5YR 4/2) dry; common faint very dark grayish brown mottles; weak fine blocky structure; very hard, very firm, very sticky and very plastic; common medium roots; few thin bedding planes; calcareous; moderately alkaline; clear wavy boundary.

A12—15 to 22 inches; dark reddish brown (5YR 3/2) clay, dark reddish gray (5YR 4/2) dry; common medium faint very dark grayish brown mottles; weak fine blocky structure; very hard, very firm, very sticky and very plastic; few fine roots; common coarse intersecting slickensides; calcareous; moderately alkaline; abrupt smooth boundary.

IIC—22 to 25 inches; reddish brown (5YR 5/3) silty clay loam, reddish brown (5YR 5/3) dry; structureless; hard, firm, sticky and plastic; few fine roots; calcareous; moderately alkaline; abrupt smooth boundary.

IIIC—25 to 60 inches; reddish brown (5YR 4/3) clay, reddish brown (5YR 4/3) dry; structureless; very hard, very firm, very sticky and very plastic; few medium intersecting slickensides; calcareous; moderately alkaline.

The A horizon when moist is dark brown or dark reddish brown. Some pedons have mottles of very dark grayish brown, very dark gray, or dark grayish brown. Reaction is mildly alkaline or moderately alkaline.

The IIC and IIIC horizons are reddish brown, reddish yellow, yellowish red, brown, or strong brown. Texture is clay or silty clay. Some pedons have layers of very fine sandy loam and silty clay loam. Reaction is mildly alkaline or moderately alkaline.

Tabor series

The Tabor series consists of deep, moderately well drained, loamy soils on uplands. They formed in thick, unconsolidated coastal plain sediment. Slope ranges from 1 to 5 percent.

Typical pedon of Tabor fine sandy loam, 1 to 5 percent slopes, in northwest part of Waller County; from intersection of U.S. Highway 290 and Austin Street in downtown Hempstead, 0.6 mile west on Austin Street, 0.4 mile north on 15th Street, 2.5 miles west on Austin Branch Road, 0.7 mile south on county road, 300 feet west of road in wooded pasture:

A1—0 to 9 inches; brown (10YR 5/3) fine sandy loam, pale brown (10YR 6/3) dry; weak fine subangular blocky structure; slightly hard, friable; many coarse and medium roots; very strongly acid; clear smooth boundary.

A2—9 to 15 inches; very pale brown (10YR 7/3) fine sandy loam, very pale brown (10YR 8/3) dry; weak fine subangular blocky structure; soft, friable; many medium roots; strongly acid; abrupt smoooth boundary.

B21t—15 to 26 inches; yellowish brown (10YR 5/6) clay, brownish yellow (10YR 6/6) dry; common medium distinct mottles of brown (10YR 5/3) and red (2.5YR 4/6); moderate medium subangular blocky structure; very hard, very firm; common fine roots; prominent clay films on peds; very strongly acid; clear wavy boundary.

B22t—26 to 38 inches; yellowish brown (10YR 5/6) clay, brownish yellow (10YR 6/6) dry; common medium distinct mottles of brown (10YR 5/3); moderate medium subangular blocky structure; very hard, very firm; few fine roots; prominent clay films on peds; few fine siliceous pebbles; neutral; clear wavy boundary.

B23t—38 to 51 inches; yellowish brown (10YR 5/4) clay, light yellowish brown (10YR 6/4) dry; few medium faint mottles of yellowish brown (10YR 5/6); moderate medium subangular blocky structure; very hard, very firm; prominent clay films on peds; mildly alkaline; clear wavy boundary.

B3—51 to 62 inches; light gray (10YR 7/1) clay, white (10YR 8/1) dry; common medium distinct mottles of yellowish brown (10YR 5/4) and dark red (2.5YR 3/6); weak medium subangular blocky structure; very hard, very firm; patchy clay films on peds; moderately alkaline; clear smooth boundary.

C—62 to 69 inches; light brownish gray (10YR 6/2) clay, white (10YR 8/2) dry; common medium distinct mottles of yellowish brown (10YR 5/4) and yellowish red (10YR 5/6); massive; very hard, very firm; few fine concretions of calcium carbonate; moderately alkaline.

The solum is 50 to 70 inches thick. During dry periods the soils have cracks that are 1 cm or more wide in the upper part of the subsoil.

The A horizon is 10 to 20 inches thick. The A1 and A2 horizons are light brownish gray, grayish brown, pale brown, or very pale brown when dry. The A2 horizon is 1 to 2 in value lighter than the A1 horizon.

The B21t and B23t horizons are yellowish brown or brownish yellow with brown, light gray, red, yellowish red, pale brown, and red mottles. Clay content is 40 to 60 percent. Reaction is very strongly acid to mildly alkaline in the lower part.

Tremona series

The Tremona series consists of deep, somewhat poorly drained, sandy soils on uplands. They formed in thick, unconsolidated clayey and sandy coastal plain sediment. Slope ranges from 1 to 8 percent.

Typical pedon of Tremona loamy fine sand, 1 to 5 percent slopes (fig. 15), in north part of Waller County; from junction of Texas Highway 6 and Farm Road 1736, 3.1 miles east on Farm Road 1736 to entrance to Rolling Hills, 0.1 mile south, 0.4 mile west on private road, 0.3

mile south on private road, 0.2 mile west, 150 feet south of road in woodland:

A1—0 to 6 inches; dark brown (7.5YR 4/2) loamy fine sand, pinkish gray (7.5YR 6/2) dry; single grained; soft, friable; common coarse roots; medium acid; clear smooth boundary.

A21—6 to 20 inches; light brown (7.5YR 6/4) loamy fine sand, pink (7.5YR 8/4) dry; single grained; soft, loose; common medium roots; few siliceous pebbles 10 to 20 mm in size; strongly acid; clear smooth boundary.

A22—20 to 26 inches; light brown (7.5YR 6/4) gravelly loamy fine sand, pink (7.5YR 8/4) dry; single grained; soft, loose; few medium roots; 40 percent siliceous gravel 10 to 40 mm in size; strongly acid; abrupt wavy boundary.

B21tg—26 to 32 inches; grayish brown (10YR 5/2) clay, light brownish gray (10YR 6/2) dry; common medium distinct mottles of red (2.5YR 4/6) and yellowish brown (10YR 5/6); moderate medium blocky structure; very hard, very firm; few fine roots; 15 percent siliceous gravel 10 to 40 mm in size; very strongly acid; clear wavy boundary.

B22tg—32 to 48 inches; grayish brown (10YR 5/2) clay, light brownish gray (10YR 6/2) dry; common coarse prominent mottles of red (10R 4/6) and yellowish brown (10YR 5/6); moderate medium blocky structure; very hard, very firm; a few siliceous pebbles 10 to 40 mm in size; very strongly acid; clear wavy boundary.

B3g—48 to 55 inches; light gray (10YR 7/1) sandy clay, white (10YR 8/1) dry; common coarse prominent mottles of dark yellowish brown (10YR 4/6) and yellowish brown (10YR 5/6); weak medium blocky structure; very hard, firm; very strongly acid; clear smooth boundary.

C—55 to 70 inches; dark yellowish brown (10YR 4/6) clay, yellowish brown (10YR 5/6) dry; common coarse prominent mottles of light gray (10YR 7/1); massive; very hard, very firm; very strongly acid.

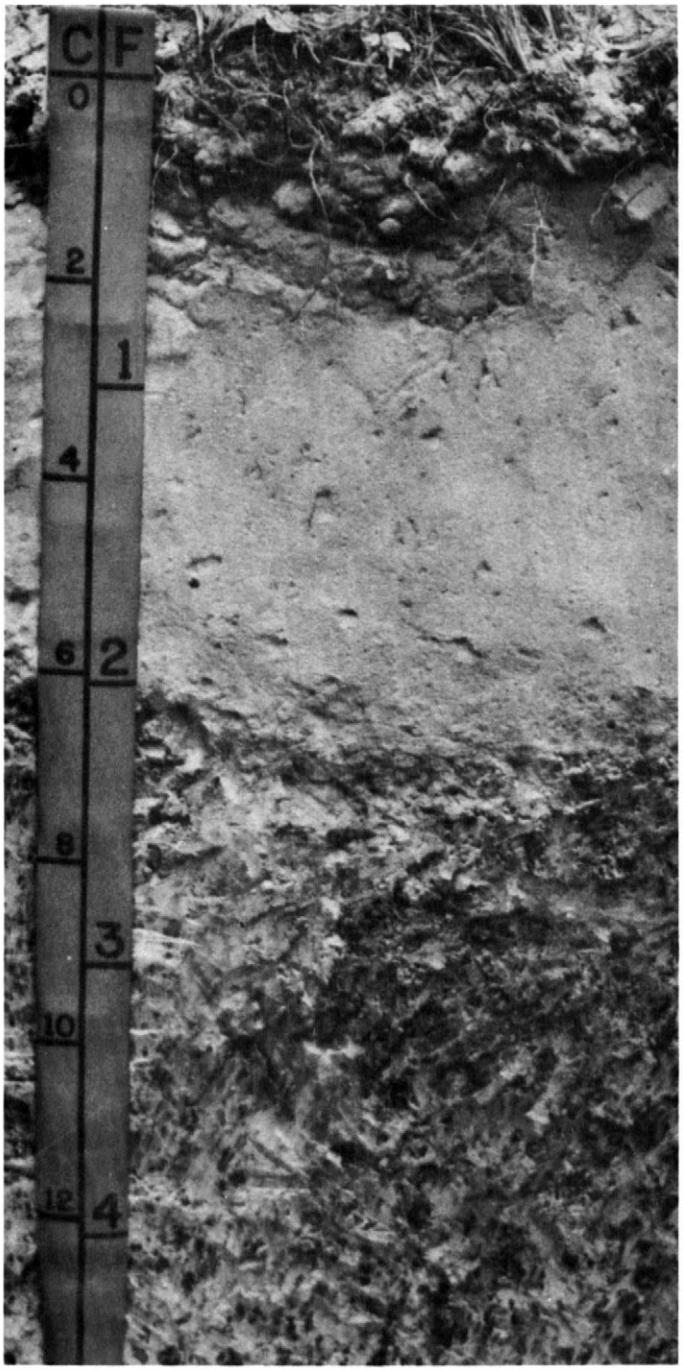


Figure 15.—Profile of Tremona loamy fine sand, which has a sandy surface layer and a mottled clay subsoil. Scale in decimeters and feet.

The solum is more than 60 inches thick.

The A horizon is 20 to 40 inches thick. The A1 horizon when dry is brown, pinkish gray, or pale brown. The A2 horizon is light brown, pale brown, or very pale brown. Reaction is strongly acid to slightly acid. The boundary between the A and B horizons is clear to abrupt.

The B21tg horizon is grayish brown, brown, or light brownish gray and is usually mottled in shades of red, yellowish brown, grayish brown, dark red, and reddish yellow. Texture is clay or sandy clay with 40 to 50 percent clay. Reaction is very strongly acid to strongly acid.

The B22tg horizon is grayish brown and is prominently mottled in shades of red, yellowish brown, strong brown, and dark red. It is clay, sandy clay, or sandy clay loam with 32 to 50 percent clay. Reaction ranges from very strongly acid to strongly acid.

Trinity series

The Trinity series consists of deep, somewhat poorly drained, clayey soils on flood plains. They formed in recent clayey alluvium. Slope ranges from 0 to 2 percent but is generally less than one percent.

Typical pedon of Trinity clay, frequently flooded, south of Bellville; from junction of Texas Highway 36 and Farm Road 2429, 1.5 miles south on Farm Road 2429, 100 feet west of road in native grass meadow:

A11—0 to 16 inches; black (10YR 2/1) clay, very dark gray (10YR 3/1) dry; moderate medium angular blocky structure; very hard, very firm, very sticky and very plastic; few slickensides; abundant fine roots; calcareous; moderately alkaline; gradual boundary.

A12—16 to 50 inches; very dark gray (10YR 3/1) clay, same color when dry; weak medium subangular blocky structure; very hard, very firm, very sticky and very plastic; many slickensides; many roots; calcareous; moderately alkaline; gradual boundary.

A13—50 to 65 inches; black (10YR 2/1) clay, very dark gray (10YR 3/1) dry; weak medium subangular blocky structure; very hard, very firm, very sticky and very plastic; common intersecting slickensides; few concretions of calcium carbonate; calcareous; moderately alkaline.

Undisturbed areas have gilgai microrelief. When the soils is dry, cracks up to 2 inches wide extend to a depth of 40 inches or more. The soil is mildly alkaline to moderately alkaline and calcareous throughout.

The A1 horizon is very dark gray or black when moist. Some pedons have brown mottles below a depth of 25 inches. Intersecting slickensides are common between depths of 25 and 60 inches.

The C horizon, where present, is very dark gray, black, dark gray, gray, or olive gray with olive and yellowish mottles. Some pedons have clay loam and sandy clay loam strata.

Waller series

The Waller series consists of deep, poorly drained, loamy soils in depressions on uplands. They formed in thick beds of loamy unconsolidated coastal plain sediment.

Typical pedon of Waller loam, depressional, in east part of Waller County; from intersection of Farm Road 362 and U.S. Highway 290 in Waller, 3.1 miles north on Farm Road 362, 0.6 mile west on county road, 200 feet north of road in pasture:

A1—0 to 6 inches; light brownish gray (10YR 6/2) loam, light gray (10YR 7/2) dry; common medium distinct mottles of yellowish brown; fine moderate subangular blocky structure; hard, friable; many fine roots; very strongly acid; clear wavy boundary.

A2g—6 to 22 inches; light brownish gray (10YR 6/2) loam, light gray (10YR 7/2) dry; common medium distinct mottles of yellowish brown; fine moderate subangular blocky structure; hard, friable; few fine roots; crayfish krotovinas have black staining of organic matter along the sides and are filled with fine sand and silt; few isolated bodies of Bt material; medium acid; clear irregular boundary.

B21tg&A2—22 to 35 inches; gray (10YR 6/1) clay loam, light gray (10YR 7/1) dry; common medium distinct mottles of strong brown; moderate medium blocky structure; thick silt coatings on faces of prisms; few clay films; common tongues of silt and very fine sand up to 1 inch in width and crayfish krotovinas extend through this horizon; very strongly acid; diffuse wavy boundary.

B22tg&A2—35 to 65 inches; gray (10YR 6/1) clay loam, light gray (10YR 7/1) dry, common medium distinct mottles of strong brown; moderate medium blocky structure; silt coatings on peds; common clay films; common tongues of silt and very fine sand up to 2 inches thick and krotovinas; very strongly acid.

The solum is more than 60 inches thick.

The A horizon is 20 to 40 inches thick. The A1 and A2 horizons when moist are light gray or light brownish gray with yellowish brown and very pale brown mottles in some pedons. The A2 horizon is generally 1 to 2 in value lighter than the A1 horizon in a pedon. Reaction is medium acid to very strongly acid. The boundary between the A and B horizons is gradual.

B2t&A2 horizon is gray or grayish brown with strong brown, yellowish brown, dark yellowish brown, or red mottles. Texture is clay loam or sandy clay loam. Tongues of very fine sandy loam or silt extend into the horizon. Reaction is very strongly acid to slightly acid.

Wilson series

The Wilson series consists of deep, somewhat poorly drained, loamy soils on uplands on ancient stream terraces. They formed in clayey alluvium. Slope ranges from 0 to 3 percent.

Typical pedon of Wilson clay loam, 0 to 1 percent slopes, in northeast part of Austin County; from intersection of Texas Highway 159 and Farm Road 1456, 0.1 south on Farm Road 1456, 100 feet east of road in cropland:

Ap—0 to 7 inches; very dark gray (10YR 3/1) clay loam, dark gray (10YR 4/1) dry; weak medium subangular blocky structure; firm, hard, slightly sticky and slightly plastic; many medium and fine roots; few fine pores; neutral; abrupt wavy boundary.

B21tg—7 to 23 inches; dark gray (10YR 4/1) silty clay, gray (10YR 5/1) dry; few fine faint mottles of yellowish brown; moderate medium blocky structure;

very firm, very hard, sticky and plastic; common fine roots; prominent thick clay films on peds; cracks extending into horizon filled with very dark gray (10YR 3/1) material; neutral; gradual smooth boundary.

B22tg—23 to 34 inches; dark gray (10YR 4/1) clay, gray (10YR 5/1) dry; few fine faint mottles of dark yellowish brown and gray; moderate medium subangular blocky structure; very hard, very firm, sticky and plastic; few fine roots; common distinct clay films; neutral; gradual smooth boundary.

B23tg—34 to 54 inches; dark grayish brown (10YR 4/2) clay, dark grayish brown (10YR 4/2) dry; common faint mottles of dark gray and yellowish brown; moderate medium subangular blocky structure; very hard, very firm, sticky and plastic; common distinct films; common medium concretions of calcium carbonate; moderately alkaline; clear smooth boundary.

B24tg—54 to 64 inches; dark gray (10YR 4/1) clay, dark gray (10YR 4/1) dry; common medium faint mottles of grayish brown and yellowish brown; moderate medium subangular blocky structure; very hard, very firm, very sticky and very plastic; common faint clay films; common fine and medium concretions of calcium carbonate; moderately alkaline.

The solum is more than 40 inches thick. When dry, these soils have cracks that are 1 cm or more wide in the upper part of the subsoil.

The Ap horizon is dark gray, very dark gray, dark grayish brown, or grayish brown when moist. Reaction is medium acid to neutral. The boundary bewteen the Ap and B21tg horizons is abrupt to gradual.

The B21tg horizon is dark gray or very dark gray. Texture is clay or silty clay with 40 to 60 percent clay. Reaction is medium acid to moderately alkaline.

The B22tg horizon is dark gray or gray with few to common dark yellowish brown, gray, and olive mottles. Texture is clay or silty clay. Reaction is neutral to moderately alkaline. Few fine calcium carbonate and gypsum crystals are generally in this horizon and increase in abundance with depth.

The B23tg and B24tg horizons are dark grayish brown or dark gray with grayish and brownish mottles.

Wockley series

The Wockley series consists of deep, somewhat poorly drained, loamy soils on uplands. These soils formed in thick, loamy, unconsolidated coastal plain sediment. Slope ranges from 0 to 3 percent.

Typical pedon of Wockley fine sandy loam, 0 to 1 percent slopes, near Prairie View; from intersection of U.S. Highway 290 and Farm Road 1098, 1.4 miles north through campus to intersection of Cameron Road, 1.4 miles east and south on Cameron Road, 100 feet west of road in cropland:

Ap—0 to 12 inches; dark grayish brown (10YR 4/2) fine sandy loam, grayish brown (10YR 5/2) dry; common fine faint mottles of brownish yellow; weak fine subangular blocky structure; slightly hard, very friable; many fine roots; many fine pores; slightly acid; abrupt smooth boundary.

A2—12 to 23 inches; brown (10YR 5/3) fine sandy loam, pale brown (10YR 6/3) dry; weak fine subangular blocky structure; slightly hard, very friable; many fine pores; many fine roots; medium acid; gradual smooth boundary.

B21t—23 to 32 inches; light brownish gray (10YR 6/2) sandy clay loam, light gray (10YR 7/2) dry; common medium distinct mottles of yellowish brown (10YR 5/6) and red (2.5YR 4/6); moderate medium subangular blocky structure; hard, friable; common fine roots; common fine pores; 8 to 10 percent by volume plinthite; medium acid; clear smooth boundary.

B22t—32 to 56 inches; light gray (10YR 7/1) clay loam, same color when dry; common medium distinct mottles of strong brown (7.5YR 5/8) and yellowish red (5YR 5/8); moderate medium subangular blocky structure; very hard, very firm; few fine roots; 10 to 15 percent by volume plinthite; 3 to 5 percent ironstone gravel less than 5 mm in diameter; medium acid; gradual smooth boundary.

B23t—56 to 80 inches; reticulately mottled brownish yellow (10YR 6/6), red (2.5YR 4/6), and gray (10YR 6/1) clay loam; moderate medium subangular blocky structure; extremely hard, very firm; 12 to 15 percent by volume plinthite; 3 to 4 percent by volume ironstone gravel less than 5 mm in diameter; slightly acid; gradual smooth boundary.

The solum is more than 80 inches thick.

The A horizon is 20 to 30 inches thick. The Ap horizon when moist is dark grayish brown, dark brown, grayish brown, or brown with a few brownish yellow mottles. The A2 horizon is brown, pale brown, light yellowish brown, light brown, light gray, or very pale brown. Some pedons have a few brown and brownish yellow mottles. Reaction is slightly acid to strongly acid.

The B21t horizon is light brownish gray, brown, pale brown, or yellowish brown mottled in shades of yellowish brown, red, light yellowish brown, strong brown, brownish yellow, light gray, light brownish gray, and grayish brown. Texture is sandy clay loam or clay loam with 25 to 35 percent clay. Reaction is very strongly acid to medium acid.

The B22t horizon is light gray, grayish brown, or light brownish gray and distinctly mottled in shades of strong brown, reddish brown, brownish yellow, gray, and light brownish gray. It is sandy clay loam or clay loam with 28

to 35 percent clay. Reaction ranges from strongly acid to medium acid.

The B23t horizon is reticulately mottled in shades of red, yellow, gray, and brown.

formation of the soils

factors of soil formation

Soil is a three-dimensional body on the earth's surface that supports plants. Properties of the soil result from the parent material and from additions, removals, transfers, and transformations caused by climate, living organisms, topography, and time. Also important are the cultural environment and man's use of the soil.

The interaction of the five soil-forming factors results in differences among the soils. Climate and plants and animals are the active factors. They act on the parent material through the weathering of rocks and through subsequent transportation by water and wind; they slowly change it into a natural body with genetically related horizons. The effects of climate and plants and animals are conditioned by topography. Soils on flood plains, for example, are quite different from those on well drained uplands. The parent material also affects the kind of profile that can form and sometimes determines it entirely. Finally, time is needed to change parent material into soil. Generally, a long time is needed for distinct horizons to form.

parent material

Parent material is the unconsolidated mass in which a soil forms. It determines the limits of the chemical and mineralogical composition of the soil. In Austin and Waller Counties the soils formed in materials from three geological systems: Recent, Pleistocene, and Miocene. They include the Fleming, Willis, Lissie, and Beaumont Formations plus Recent material.

Hockley and Wockley soils formed in loamy material, which permits moderate water movement. These soils have clay-enriched horizons that contain concretions of iron. Frelsburg and Bleiblerville soils formed in calcareous clayey material. The churning of this clay prevents differentiation of horizons. The parent material in the survey area is described in more detail in the section on geology.

climate

The humid climate of Austin and Waller Counties, which has existed as the soils formed, promotes moderately rapid soil development. The climate is uniform throughout the survey area, but its effect is modified locally by runoff and in some areas by the direction of exposure. Major differences among soils in this area are not believed to have resulted from climate.

living organisms

Plants, micro-organisms, earthworms, crayfish, and other living things have contributed to soil development. Addition of organic matter and nitrogen to the soil, addition and removal of plant nutrients, and change in structure and porosity are caused by plants and animals.

Plants, dominantly tall and mid grasses, have affected soil formation in Austin and Waller Counties more than animals have. Prairie climax vegetation has contributed significantly to the accumulated organic matter and resultant darkening of the surface layer in Brenham, Lake Charles, Cuero, Klump, and many other soils. Having formed under timber, however, Boy, Conroe, and Depcor soils are generally low in organic matter.

topography

Topography, or relief, affects soil formation through its influence on drainage, erosion, plant cover, and soil temperature. The topography of Austin and Waller Counties ranges from nearly level in the south and east to gently undulating and gently rolling in the northwest.

The degree of profile development often depends on the amount of moisture in the soil. Waller and Aris soil are in depressions that receive extra water; therefore, the soils have developed gleyed characteristics. Because the soils are poorly drained and wet, horizonation is degraded. More sloping Hockley and Silawa soils are better drained and have brighter colors and distinct horizons throughout. Soils on foot slopes, such as Cuero soils, receive additions of material and have a thick, dark surface layer. Soils on hillsides, such as Latium soils, have a thin surface layer because removal of the surface layer by erosion is as rapid as its development.

time

Time, usually a long time, is required for the formation of distinct horizons. The difference in time that parent materials have been in place is generally reflected by differences in the degree of development of the soil profiles. The soils in Austin and Waller Counties range from young to old. The young Norwood and Oklared soils on flood plains have little horizon development.

Except for darkening of the surface layer, they closely resemble the parent material. Annona and Crockett soils are older and have developed distinct horizons that do not resemble the parent material.

processes of horizon differentiation

Several processes are involved in the formation of horizons in soils: accumulation of organic matter, leaching of carbonates and other bases, reduction and transfer of iron, and formation and translocation of silicate clay minerals. In most soils more than one of these processes have been active in the development of horizons.

Accumulation of organic matter in the upper part of a profile forms a distinct dark surface layer. The soils in Austin and Waller Counties range from low to medium in organic matter content. Brenham, Cuero, and Bleiblerville soils have accumulated organic matter forming a dark surface layer.

Carbonates have been leached downward in many of the soils in this area. Much leaching has occurred in Crockett and Axtell soils but little in Brenham and Latium soils, which are still high in carbonates.

Reduction and transfer of iron, a process called gleying, is evident in the poorly drained and somewhat poorly drained soils. Gray colors in the lower layers of Edna, Katy, Wockley, and Waller soils indicate reduction and loss of iron. Yellowish brown, strong brown, and reddish brown mottles and concretions in some horizons indicate segregation of iron. Hockley, Styx, and Monaville soils have such mottles, and Conroe and Hockley soils have nodules of ironstone.

The translocation of clay minerals has also contributed to horizon development in many soils in Austin and Waller Counties. Clay minerals are the product of weathering of primary minerals. The subsoil in many soils has accumulations of clay (clay films) in pores and on peds. These soils were probably leached of carbonates and bases before the translocation of silicate clay took place. A horizon with accumulations of translocated clay is called an argillic horizon. Crockett, Styx, and Straber soils, for example, have an argillic horizon.

surface geology

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Austin and Waller Counties are in the West Gulf Coastal Plain (*5*). The underlying formations are arrayed mainly in broad bands that parallel the gulf and dip gently toward it. Some of the younger formations can be traced into stream terraces that border the Brazos River. The parent materials of the soils range in age from less than 12,000 years (Holocene alluvium) to over 5 million years (Miocene fluvial formations).

The general soil map can serve as an approximate guide to the geology of the counties and can aid in grouping the soils into age and formational categories.

The Fleming Formation of Miocene age is the oldest geologic unit exposed in the area and may be between 5 and 23 million years old. This formation consists of calcareous clay and silt, calcite-cemented sandstone, and conglomerate (gravel) of calcareous nodules or concretions. The nodules are similar to those found in the upper 10 feet of the younger Beaumont Formation, where they formed in place. The nodules in the Fleming Formation are probably derived from local sources, possibly caliche deposits, during the deposition of the Fleming material.

The calcareous clay and the calcium carbonate in the rest of the Fleming Formation originated from upper Cretaceous marl and limestone, and the more quartzose sands come from older Tertiary formations. The Fleming Formation was probably laid down by low-velocity, meandering streams.

The soils of the Frelsburg-Latium-Crockett, the Klump-Carbengle-Brenham, and the Frelsburg-Bleiblerville-Latium associations formed in material weathered from the Fleming Formation. These include the bulk of the Vertisols and soils of vertic subgroups in the area. In particular, the solum of Brenham, Bleiblerville, and Latium soils, among others, formed completely in Fleming material. However, the Crockett and Klump soils have a thin sandy cover of Willis Formation over the lower Fleming part.

The Goliad Formation of Pliocene age extensively overlies the Fleming Formation and underlies the Willis Formation in nearby Victoria County. Its status in Waller and Austin Counties is uncertain. In most outcrops to the south, it is mainly surfaced with caliche deposits, while in some minor outcrops calcareous clay, silt, sand, and gravel are exposed. The only major undisputed outcrop in this survey area is in Stephen F. Austin State Park due north of San Felipe. It is along the southwestern side of the Brazos River at about the normal river level. Outcrops along Mill Creek have also been mapped. Some of the calcareous parent material designated as Fleming may actually belong to the younger Goliad Formation, particularly those with siliceous pebbles presumed to be residual from the overlying Willis Formation.

The Willis Formation is the next younger formation. It unconformably overlies the Fleming Formation and underlies the Lissie Formation. The Willis Formation is largely of fluviatile origin. It is mostly sand with some siliceous gravel, silt, and clay. The coarser components were probably deposited in channels and point bars; the finer in levees and flood basins.

The Willis Formation has been oxidized and otherwise weathered to depths of more than 15 feet in many places. Secondary ironstone pebbles, in addition to the siliceous gravel, are in soils that formed in Willis parent material. Many of these soils are plinthitic and yield ironstone concretions upon being exposed to air. In some exposures the Willis bedrock displays well developed fluvial crossbedding. In some of these exposures, clay clasts eroded from older formations or from then adjacent contemporaneous Willis deposits are among the siliceous gravel. Such clasts upon weathering may break down into the constituent clay and yield anomalous poorly bedded or unbedded clay and gravel sediment. The dehydration and recystallization of iron oxides attendant upon the formation of plinthite and ironstone concretions may also destroy bedding.

Because the Willis Formation almost totally lacks fossils or material suitable for radiometric dating (e.g., volcanic ash), its age is in dispute. Age estimates have ranged from Pliocene to early glacial Pleistocene. Recent work suggests a late Pliocene, Pliocene-Pleistocene to early preglacial (pre-Nebraskan) age, which makes it as old as 2 1/2 million years (*4*).

The Willis Formation is the major exposed formation in the two counties and is the parent material for most of the Wockley-Hockley and Hockley-Wockley-Monaville soils and most of the several associations comprising the Sandy and Loamy Soils of Timberlands. In these associations, the formation is thick enough for the soils to have formed completely in Willis material. Considering the deep weathering of the Willis rock, some soils may

actually have formed in the B and C horizons of yet older soils that had been produced under an oxisolic or lateritic weathering regime.

In Austin County, the Willis Formation has a rather patchy distribution, especially in the areas of the Frelsburg-Latium-Crockett, Klump-Carbengle-Brenham, and Frelsburg-Bleiblerville-Latium associations. Here the Willis Formation varies greatly in thickness. Parts of the solum of the Crockett, Frelsburg, Klump, and Cuero soils formed from a thin, almost vanished cover of Willis material over the Fleming Formation. In the Frelsburg soil, the only evidence for the former Willis cover are the few siliceous pebbles which probably fell into cracks during the formation of this vertisol.

The stratigraphically higher Willis Formation usually occupies the higher topographic positions. However, in some areas it occurs on hillsides and the Fleming Formation crops out on adjacent hilltops. These topographic reversals may be due in part to the channeling of the Fleming rock by the streams that would deposit Willis material between the higher Fleming interfluves. Also, since the dissection of the Willis rock in later Pleistocene time, some Willis sediments have been moved downslope as colluvial or mass-wasted material and later been recemented by iron oxides to form Willis-like material.

The Willis areas in grassland or prairie are mainly the Wockley-Hockley and Hockley-Wockley-Monaville associations, but one small area of the Willis Formation may underlie a part of the grassland Katy association, which for the most part occupies younger formations. This area is Reids Prairie (in north-central Waller County), where a comparatively flat, undissected area of the Katy association in grassland is surrounded by soils of the Depcor-Boy-Splendora association of soils derived from the Willis Formation under forest. The periphery of Reids Prairie seems to record the gradual encroachment of the forest at the expense of grassland. On the other hand, Reids Prairie may be on the Bentley Formation, which some geologists incorporate into the Lissie Formation.

The next two younger formations, the Lissie and the Beaumont, are Pleistocene in age and fluvial in origin. The Lissie Formation has both gulf-paralleling coastal plain outcrops and stream terraces outcrops along the Brazos River; the Beaumont Formation has only stream terrace outcrops in this survey area.

The deposition of these two post-Willis Pleistocene units and the Holocene alluvial deposits of the major streams was controlled by sea level changes associated with the advance and retreat of world-wide continental glaciers (*3*). Major glaciation began 1 1/2 to 2 1/2 million years ago. During the time of glacial expansion, sea level declined as water accumulated in glacial ice on the continents. Streams draining ice-free parts of the world, including coastal regions of Texas, entrenched their valleys as they flowed to the more distant shorelines of diminished oceans. As the ice melted during interglacial periods, the sea rose to levels similar to the present. The deep valleys were filled with alluvium, and the alluvium formed deltas, plains, and coastal marshes. Thus, these several formations were probably deposited during intervals of high sea level similar to the present.

Each of the Pleistocene units was tilted gulfward following its deposition as the margin of the Gulf subsided. Older formations are successively more steeply dipping than younger ones.

The Lissie Formation, which is below the Beaumont Formation and above the Willis Formation, is sometimes divided into two distinct formations, an older Bentley and a younger Montgomery. Some geologists believe that the two units of the Lissie Formation cannot be separated and hence lump them together; others believe that only one unit exists. The division has some utility in explaining some of the soils on stream terraces.

The extensive Katy association in the southern part of the two counties developed on a coast-wise part of the Lissie Formation. The Lissie Formation also underlies stream terraces along the Brazos River including the Wilson-Burleson association on the western side of the Brazos River in Austin County; the lower, westward (riverward) parts of the Tabor-Tremona-Chazos and Kenney-Tabor-Chazos associations in the vicinity of Hempstead in Waller County; and the eastern, higher part of the Lake Charles-Midland-Edna association in Waller County.

The microrelief features of the Katy association, and to a minor extent the other prairie associations, are of interest because they are the sites of specific soil series: pimple mounds and small undrained depressions. The pimple mounds are the sites of Katy soils, particularly in the Katy-Edna complex. The undrained depressions are sites of Aris and Waller soils.

Pimple mounds are small, round to elliptical knolls 50 to 200 feet in diameter and generally less than 3 feet high. In the Gulf Coast of Texas they are generally confined to the Pleistocene surfaces. In most areas the soils on the mounds have a thicker, more loamy or more sandy surface layer (A1 horizon) than the intermound soils. In the Katy-Edna complex, the Katy soil has a loamy surface layer similar to that of the Edna soil but about three times thicker. Theories of the origin of these mounds include (a) residual patches left after sheet erosion or deflation by wind; (b) accumulation of wind-transported sand, silt, clay pellets, or clay chips around clumps of vegetation; (c) wind accumulations whose sites were started by, or later enhanced by, erosion; or (d) "fluffing up," or lowering of bulk density, of A and B horizons by burrowing animals with possible eolian additions.

Shallow, undrained depressions, such as those occupied by the Aris and Waller soils, are circular to regular in shape, 20 to 400 feet in diameter, and less than 3 feet deep. Suggestions concerning their origin

include (a) wind excavation or deflation, (b) subsidence resulting from the solution of subsurface material, and (c) piping or subsurface erosion. Most likely, they are blowouts made during previous dryer climates. At present the shallow basins are occupied by loamy soils whose parent material was probably washed from the slightly higher surrounding area; thus the depressions are generally in a filling, or depositional, phase rather than a deflationary phase.

The Beaumont Formation in this survey area occurs only on terraces. Elsewhere in the Gulf Coast of Texas it is the most extensive of the coast-wise Pleistocene formations.

On the west side of the Brazos River in Austin County the areas of the Lake Charles-Midland-Edna association are on well-defined terraces of Beaumont age. On the east side of the river, the picture is less clear. The western-most salient of the Katy association terminates in a westward-facing scarp that is probably the same age as the Beaumont terraces on the west side of the river. This scarp is poorly defined and bounds a terrace that extends northwestward into the river side of the Lake Charles-Midland-Edna association, the bulk of which is underlain by the Lissie Formation. This terrace is surfaced in many places with Lake Charles soils.

Several terrace levels between the Beaumont-age terraces and the Holocene flood plain are along both sides of the Brazos River and can be in part identified by the small patches of the Kenney-Tabor-Chazos and Tabor-Tremona-Chazos associations that flanked the flood plain. They probably span a time range between the late Pleistocene and the beginning of the Holocene. Their surfaces have been considerably modified by wind action, as indicated by the sandy, thick-surfaced Kenney soils, among others.

The Holocene flood plain of the Brazos River is graded to the present sea level, which was attained between 3,500 and 5,000 years ago. About 18,000 years ago sea level was perhaps 260 feet or more below the present level. The Brazoria-Norwood association formed on the Brazos flood plain and is underlain by the youngest sediments in the survey area. These reddish brown sediments are derived from red beds of Permain and Triassic age into which the upper reaches of the Brazos River are penetrating to the northwest.

The Trinity association on Mill Creek and its tributaries likewise formed in Holocene sediments, the dark colors of which indicate Fleming and older Tertiary sources.

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glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	More than 12

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Caliche. A more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds just beneath the solum, or it is exposed at the surface by erosion.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles up to 38.1 centimeters (15 inches) long.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated

compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or arresting grazing for a prescribed period.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly

continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.
Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil; from the unconsolidated parent material.

Gilgai. Commonly a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of Vertisols—clayey soils having a high coefficient of expansion and contraction with changes in moisture content.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual.* The major horizons of mineral soil are as follows:
O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.
A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.
B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.
C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.
R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, invader plants follow disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. The soil is not strong enough to support loads.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron,

and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affects the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plinthite. The sesquioxide-rich, humus-poor, highly weathered mixture of clay with quartz and other diluents. It commonly appears as red mottles, usually in platy, polygonal, or reticulate patterns. Plinthite changes irreversibly to an ironstone hardpan or to irregular aggregates on repeated wetting and drying, especially if it is exposed also to heat from the sun. In a moist soil, plinthite can be cut with a spade. It is a form of laterite.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability or an impermeable layer near the surface, the soil may not adequately filter effluent from a waste disposal system.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor, on the basis of how much the present plant community has departed from the potential.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differs from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slow intake (in tables). The slow movement of water into the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, that are present in soils in extremely small amounts. They are essential to plant growth.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1951-78 at Sealy, Texas]

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days[1]	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F		In	In	In		In
January	64.4	42.7	53.6	82	18	201	2.56	1.10	3.80	5	0.0
February	67.0	44.8	55.9	84	23	210	3.23	1.37	4.80	6	.0
March	73.9	50.3	62.1	89	28	386	2.08	.45	3.35	4	.0
April	81.2	59.5	70.4	91	39	612	3.36	1.43	4.99	4	.0
May	86.7	65.1	75.9	95	48	803	4.75	1.82	7.19	6	.0
June	92.6	70.0	81.3	100	59	939	4.29	1.19	6.77	5	.0
July	96.0	71.7	83.9	104	66	1,051	2.23	.60	3.53	4	.0
August	96.3	71.2	83.8	105	63	1,048	2.84	.78	4.50	4	.0
September	91.1	67.4	79.2	101	53	876	4.38	.91	7.08	5	.0
October	83.5	58.4	71.0	95	40	651	4.11	.96	6.61	4	.0
November	73.3	49.6	61.5	88	27	345	2.93	.87	4.60	5	.0
December	66.3	44.7	55.5	83	22	221	3.64	1.70	5.31	6	.0
Yearly	81.0	58.0	69.5	106	17	7,343	40.40	29.90	49.89	58	.0

[1] A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1951-78 at Sealy, Texas]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	February 20	March 12	March 26
2 years in 10 later than--	February 10	March 1	March 17
5 years in 10 later than--	January 20	February 9	March 1
First freezing temperature in fall:			
1 year in 10 earlier than--	November 29	November 9	November 6
2 years in 10 earlier than--	December 9	November 19	November 14
5 years in 10 earlier than--	December 29	December 9	November 30

TABLE 3.--GROWING SEASON

[Recorded in the period 1951-78 at Sealy, Texas]

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	304	266	243
8 years in 10	314	278	254
5 years in 10	345	302	274
2 years in 10	>365	328	293
1 year in 10	>365	345	304

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Austin County	Waller County	Total-- Area	Total-- Extent
		Acres	Acres	Acres	Pct
AnA	Annona fine sandy loam, 0 to 1 percent slopes	0	710	710	0.1
AnC	Annona fine sandy loam, 1 to 5 percent slopes	0	1,070	1,070	0.1
ArA	Aris fine sandy loam, 0 to 1 percent slopes	5,000	4,410	9,410	1.2
AxC	Axtell fine sandy loam, 1 to 5 percent slopes	600	3,030	3,630	0.5
AxC2	Axtell fine sandy loam, 2 to 5 percent slopes, eroded	20	390	410	0.1
AxD	Axtell fine sandy loam, 5 to 8 percent slopes	640	910	1,550	0.2
BbB	Bleiblerville clay, 1 to 3 percent slopes	3,570	0	3,570	0.5
Be	Bosque clay loam, frequently flooded	9,310	0	9,310	1.2
BoC	Boy loamy fine sand, 1 to 5 percent slopes	0	3,990	3,990	0.5
BrA	Brazoria clay, 0 to 1 percent slopes	19,800	19,570	39,370	5.2
BrB	Brazoria clay, 1 to 3 percent slopes	830	1,650	2,480	0.3
Bs	Brazoria clay, depressional	7,420	6,720	14,140	1.9
BtD	Brenham clay loam, 3 to 8 percent slopes	8,660	0	8,660	1.1
BuA	Burleson clay, 0 to 1 percent slopes	3,120	100	3,220	0.4
CaB	Carbengle clay loam, 1 to 3 percent slopes	660	0	660	0.1
CaC	Carbengle clay loam, 3 to 5 percent slopes	2,740	0	2,740	0.4
CaD	Carbengle clay loam, 5 to 8 percent slopes	5,320	0	5,320	0.7
CcD	Catilla loamy fine sand, 0 to 8 percent slopes	21,900	1,400	23,300	3.1
ChC	Chazos loamy fine sand, 1 to 5 percent slopes	1,680	8,900	10,580	1.4
ChD	Chazos loamy fine sand, 5 to 8 percent slopes	270	770	1,040	0.1
Cm	Clemville silt loam, occasionally flooded	750	3,260	4,010	0.5
CoC	Conroe loamy fine sand, 1 to 5 percent slopes	0	2,890	2,890	0.4
CpC	Conroe soils, graded, 1 to 5 percent slopes	0	980	980	0.1
CrC	Crockett fine sandy loam, 1 to 5 percent slopes	11,800	1,280	13,080	1.7
CrC2	Crockett fine sandy loam, 2 to 5 percent slopes, eroded	530	0	530	0.1
CrD	Crockett fine sandy loam, 5 to 8 percent slopes	4,300	0	4,300	0.6
CuB	Cuero loam, 1 to 3 percent slopes	490	0	490	0.1
CuC	Cuero loam, 3 to 5 percent slopes	1,560	0	1,560	0.2
CuD	Cuero loam, 5 to 8 percent slopes	1,440	0	1,440	0.2
DeC	Depcor loamy fine sand, 1 to 5 percent slopes	0	8,290	8,290	1.1
DuD	Dutek loamy fine sand, 5 to 8 percent slopes	240	460	700	0.1
EdA	Edna fine sandy loam, 0 to 1 percent slopes	7,370	5,580	12,950	1.7
EdB	Edna fine sandy loam, 1 to 3 percent slopes	1,420	1,420	2,840	0.4
EuC	Eufaula fine sand, 0 to 5 percent slopes	3,570	1,160	4,730	0.6
FeC	Fetzer loamy fine sand, 1 to 5 percent slopes	0	2,690	2,690	0.4
FrB	Frelsburg clay, 1 to 3 percent slopes	8,670	640	9,310	1.2
FrC	Frelsburg clay, 3 to 5 percent slopes	15,000	240	15,240	2.0
FrD	Frelsburg clay, 5 to 8 percent slopes	7,850	280	8,130	1.1
HoB	Hockley fine sandy loam, 1 to 3 percent slopes	13,450	14,730	28,180	3.7
HoC	Hockley fine sandy loam, 3 to 5 percent slopes	1,250	660	1,910	0.3
HpC	Hockley gravelly fine sandy loam, 1 to 5 percent slopes	4,650	1,550	6,200	0.8
HzC	Hockley soils, graded, 1 to 5 percent slopes	1,100	0	1,100	0.1
KaA	Katy fine sandy loam, 0 to 1 percent slopes	14,150	55,400	69,550	9.2
KaB	Katy fine sandy loam, 1 to 3 percent slopes	3,030	5,930	8,960	1.2
KcB	Katy-Edna complex, 0 to 3 percent slopes	750	0	750	0.1
KeD	Kenney loamy fine sand, 1 to 8 percent slopes	17,770	10,050	27,820	3.7
KlC	Klump sandy loam, 3 to 5 percent slopes	4,120	0	4,120	0.5
KlD	Klump sandy loam, 5 to 8 percent slopes	4,200	0	4,200	0.6
KnC	Knolle loamy sand, 1 to 5 percent slopes	4,500	0	4,500	0.6
KuC	Kuy loamy fine sand, 1 to 5 percent slopes	3,650	0	3,650	0.5
KyB	Kuy-Aris complex, 0 to 3 percent slopes	5,100	0	5,100	0.7
LaA	Lake Charles clay, 0 to 1 percent slopes	16,900	1,960	18,860	2.5
LaB	Lake Charles clay, 1 to 3 percent slopes	1,880	870	2,750	0.4
LaD	Lake Charles clay, 3 to 8 percent slopes	2,820	1,180	4,000	0.5
LdC	Landman loamy fine sand, 1 to 5 percent slopes	0	1,430	1,430	0.2
LlE	Landman-Larue complex, 3 to 12 percent slopes	0	2,640	2,640	0.4
LtC	Latium clay, 2 to 5 percent slopes	5,700	360	6,060	0.8
LtE	Latium clay, 5 to 12 percent slopes	8,000	130	8,130	1.1
LuA	Lufkin fine sandy loam, 0 to 1 percent slopes	1,900	1,390	3,290	0.4
LuB	Lufkin fine sandy loam, 1 to 3 percent slopes	630	1,700	2,330	0.3
MaA	Mabank fine sandy loam, 0 to 1 percent slopes	4,270	90	4,360	0.6
MaB	Mabank fine sandy loam, 1 to 3 percent slopes	990	160	1,150	0.2
MdA	Midland clay loam, 0 to 1 percent slopes	9,600	11,920	21,520	2.9
MdB	Midland clay loam, 1 to 3 percent slopes	730	920	1,650	0.2
Mp	Midland clay loam, depressional	3,300	0	3,300	0.4
MvC	Monaville loamy fine sand, 1 to 5 percent slopes	13,650	8,000	21,650	2.9
Na	Nahatche loam, frequently flooded	3,200	9,290	12,490	1.7
NeC	Newulm loamy fine sand, 1 to 5 percent slopes	4,060	0	4,060	0.5
NoA	Norwood silt loam, 0 to 1 percent slopes	950	530	1,480	0.2
NrA	Norwood silty clay loam, 0 to 1 percent slopes	1,470	8,650	10,120	1.3
OkA	Oklared very fine sandy loam, 0 to 1 percent slopes	1,630	3,240	4,870	0.6

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Austin County	Waller County	Total-- Area	Total-- Extent
		Acres	Acres	Acres	Pct
On	Oklared-Norwood complex, frequently flooded	4,050	3,900	7,950	1.1
RaA	Rader fine sandy loam, 0 to 1 percent slopes	440	3,350	3,790	0.5
RaB	Rader fine sandy loam, 1 to 3 percent slopes	250	1,580	1,830	0.2
ReF	Renish clay loam, 5 to 20 percent slopes	430	0	430	0.1
SeC	Sealy loamy fine sand, 0 to 5 percent slopes	6,500	0	6,500	0.9
SgC	Segno fine sandy loam, 1 to 5 percent slopes	0	5,280	5,280	0.7
SlC	Silawa loamy fine sand, 1 to 5 percent slopes	1,180	360	1,540	0.2
SlD	Silawa loamy fine sand, 5 to 8 percent slopes	1,650	1,270	2,920	0.4
SpB	Splendora fine sandy loam, 0 to 3 percent slopes	0	4,910	4,910	0.7
SrC	Straber loamy fine sand, 1 to 5 percent slopes	11,320	0	11,320	1.5
SrD	Straber loamy fine sand, 5 to 8 percent slopes	4,200	0	4,200	0.6
StC	Styx loamy fine sand, 1 to 5 percent slopes	3,820	6,800	10,620	1.4
Su	Sumpf clay, frequently flooded	550	2,150	2,700	0.4
TaC	Tabor fine sandy loam, 1 to 5 percent slopes	10,230	18,600	28,830	3.8
TeC	Tremona loamy fine sand, 1 to 5 percent slopes	22,500	7,650	30,150	4.0
TeD	Tremona loamy fine sand, 5 to 8 percent slopes	2,900	950	3,850	0.5
Tr	Trinity clay, frequently flooded	18,700	0	18,700	2.5
Wa	Waller loam, depressional	380	5,600	5,980	0.8
WlA	Wilson clay loam, 0 to 1 percent slopes	4,300	630	4,930	0.7
WlB	Wilson clay loam, 1 to 3 percent slopes	2,450	420	2,870	0.4
WoA	Wockley fine sandy loam, 0 to 1 percent slopes	10,170	26,210	36,380	4.8
WoB	Wockley fine sandy loam, 1 to 3 percent slopes	2,330	9,340	11,670	1.5
	Water	1,960	2,470	4,430	0.6
	Total	426,240	327,040	753,280	100.0

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields in the N columns are for nonirrigated soils; those in the I columns are for irrigated soils. Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Corn		Peanuts		Soybeans		Rice		Improved bermudagrass		Bahiagrass	
	N	I	N	I	N	I	N	I	N	I	N	I
	Bu	Bu	Lb	Lb	Bu	Bu	Bu	Bu	AUM*	AUM*	AUM*	AUM*
AnA---------- Annona	45	---	---	---	30	---	---	---	7.0	---	6.0	---
AnC---------- Annona	45	---	---	---	30	---	---	---	7.0	---	6.0	---
ArA---------- Aris	70	---	---	---	30	---	---	100	10.0	---	8.0	---
AxC---------- Axtell	35	---	---	---	---	---	---	---	7.0	---	5.0	---
AxC2---------- Axtell	20	---	---	---	---	---	---	---	5.0	---	4.0	---
AxD---------- Axtell	---	---	---	---	---	---	---	---	5.0	---	4.0	---
BbB---------- Bleiblerville	60	---	---	---	20	---	---	---	8.0	---	---	---
Be---------- Bosque	---	---	---	---	---	---	---	---	8.0	---	---	---
BoC---------- Boy	45	---	---	---	---	---	---	---	7.5	---	7.0	---
BrA---------- Brazoria	90	100	---	---	35	---	---	100	10	---	---	---
BrB---------- Brazoria	90	---	---	---	30	---	---	---	8	---	---	---
Bs---------- Brazoria	75	90	---	---	20	---	---	---	8	---	---	---
BtD---------- Brenham	30	---	---	---	---	---	---	---	5.0	---	---	---
BuA---------- Burleson	65	---	---	---	20	---	---	---	8.0	---	---	---
CaB---------- Carbengle	40	---	---	---	20	---	---	---	7.0	---	---	---
CaC---------- Carbengle	35	---	---	---	15	---	---	---	6.0	---	---	---
CaD---------- Carbengle	30	---	---	---	---	---	---	---	5.0	---	---	---
CcD---------- Catilla	---	---	1,000	---	---	---	---	---	7.0	---	6.0	---
ChC---------- Chazos	75	---	1,300	---	---	---	---	---	7.0	---	5.0	---
ChD---------- Chazos	40	---	---	---	---	---	---	---	6.0	---	5.0	---
Cm---------- Clemville	80	---	---	---	30	---	---	---	9.0	---	---	---

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn		Peanuts		Soybeans		Rice		Improved bermudagrass		Bahiagrass	
	N	I	N	I	N	I	N	I	N	I	N	I
	Bu	Bu	Lb	Lb	Bu	Bu	Bu	Bu	AUM*	AUM*	AUM*	AUM*
CoC---------- Conroe	55	---	1,000	---	---	---	---	---	8.0	---	6.0	---
CpC---------- Conroe	---	---	---	---	---	---	---	---	5.0	---	4.0	---
CrC---------- Crockett	40	---	---	---	20	---	---	---	7.5	---	5.0	---
CrC2---------- Crockett	30	---	---	---	---	---	---	---	5.5	---	4.0	---
CrD---------- Crockett	---	---	---	---	---	---	---	---	5.0	---	4.0	---
CuB---------- Cuero	45	---	---	---	20	---	---	---	7.0	---	5.0	---
CuC---------- Cuero	35	---	---	---	20	---	---	---	6.0	---	5.0	---
CuD---------- Cuero	30	---	---	---	---	---	---	---	5.0	---	4.0	---
DeC---------- Depcor	40	---	1,000	---	---	---	---	---	8.0	---	7.0	---
DuD---------- Dutek	30	---	1,000	---	---	---	---	---	8.0	---	7.0	---
EdA---------- Edna	40	---	---	---	25	---	---	100	8.0	---	7.0	---
EdB---------- Edna	35	---	---	---	20	---	---	---	8.0	---	6.5	---
EuC---------- Eufaula	30	---	1,100	---	---	---	---	---	6.0	---	4.0	---
FeC---------- Fetzer	50	---	1,000	---	---	---	---	---	8.0	---	7.0	---
FrB---------- Frelsburg	55	---	---	---	20	---	---	---	7.0	---	---	---
FrC---------- Frelsburg	40	---	---	---	20	---	---	---	7.0	---	---	---
FrD---------- Frelsburg	30	---	---	---	---	---	---	---	5.0	---	---	---
HoB---------- Hockley	90	---	2,000	---	30	---	---	---	10.0	---	8.5	---
HoC, HpC---------- Hockley	60	---	1,500	---	20	---	---	---	8.0	---	7.0	---
HzC---------- Hockley	---	---	---	---	---	---	---	---	5.0	---	4.0	---
KaA, KaB---------- Katy	65	---	1,500	---	30	---	---	120	10	---	8.0	---
KcB---------- Katy-Edna	54	---	---	---	20	---	---	120	9.0	---	7.0	---
KeD---------- Kenney	30	---	1,500	---	---	---	---	---	8.0	---	7.0	---

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn		Peanuts		Soybeans		Rice		Improved bermudagrass		Bahiagrass	
	N	I	N	I	N	I	N	I	N	I	N	I
	Bu	Bu	Lb	Lb	Bu	Bu	Bu	Bu	AUM*	AUM*	AUM*	AUM*
KlC---------- Klump	35	---	800	---	---	---	---	---	6.5	---	5.5	---
KlD---------- Klump	30	---	---	---	---	---	---	---	6.5	---	5.5	---
KnC---------- Knolle	30	---	800	---	---	---	---	---	6.5	---	5.5	---
KuC---------- Kuy	40	---	---	---	---	---	---	---	6	---	5.0	---
KyB---------- Kuy-Aris	---	---	---	---	---	---	---	---	5.0	---	4.0	---
LaA---------- Lake Charles	75	---	---	---	30	---	---	100	10	---	---	---
LaB---------- Lake Charles	60	---	---	---	25	---	---	---	10	---	---	---
LaD---------- Lake Charles	---	---	---	---	---	---	---	---	6	---	---	---
LdC---------- Landman	45	---	1,000	---	---	---	---	---	7.5	---	7.0	---
LlE---------- Landman-Larue	50	---	1,000	---	---	---	---	---	7	---	7.0	---
LtC---------- Latium	35	---	---	---	20	---	---	---	5.5	---	---	---
LtE---------- Latium	---	---	---	---	---	---	---	---	4.0	---	---	---
LuA---------- Lufkin	35	---	---	---	---	---	---	---	5.0	---	4.5	---
LuB---------- Lufkin	35	---	---	---	---	---	---	---	5.0	---	4.5	---
MaA---------- Mabank	40	---	---	---	20	---	---	---	6	---	5.0	---
MaB---------- Mabank	40	---	---	---	20	---	---	---	6	---	5.0	---
MdA, MdB---------- Midland	40	---	---	---	30	---	---	100	6.0	---	5.0	---
Mp---------- Midland	---	---	---	---	---	---	---	---	---	---	---	---
MvC---------- Monaville	90	---	2,000	---	20	---	---	---	9.0	---	7.0	---
Na---------- Nahatche	---	---	---	---	---	---	---	---	9.0	---	8.0	---
NeC---------- Newulm	20	---	---	---	---	---	---	---	6.0	---	4.5	---
NoA, NrA---------- Norwood	110	130	---	---	30	---	---	---	10.0	---	---	---
OkA---------- Oklared	90	---	1,500	---	20	---	---	---	10.0	---	---	---

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn		Peanuts		Soybeans		Rice		Improved bermudagrass		Bahiagrass	
	N	I	N	I	N	I	N	I	N	I	N	I
	Bu	Bu	Lb	Lb	Bu	Bu	Bu	Bu	AUM*	AUM*	AUM*	AUM*
On---------- Oklared-Norwood	---	---	---	---	---	---	---	---	8.0	---	---	---
RaA, RaB---------- Rader	55	---	1,200	---	20	---	---	---	8.0	---	7.0	---
ReF---------- Renish	---	---	---	---	---	---	---	---	---	---	---	---
SeC---------- Sealy	---	---	---	---	---	---	---	---	6.0	---	5.0	---
SgC---------- Segno	70	---	1,500	---	20	---	---	---	9.0	---	8	---
SlC---------- Silawa	45	---	1,500	---	20	---	---	---	8.0	---	7.0	---
SlD---------- Silawa	30	---	1,000	---	---	---	---	---	5.0	---	5.0	---
SpB---------- Splendora	50	---	---	---	---	---	---	---	8.0	---	6.0	---
SrC---------- Straber	75	---	1,200	---	---	---	---	---	6.0	---	5.0	---
SrD---------- Straber	40	---	---	---	---	---	---	---	5	---	4.0	---
StC---------- Styx	75	---	1,500	---	---	---	---	---	7.0	---	6.0	---
Su---------- Sumpf	---	---	---	---	---	---	---	---	---	---	---	---
TaC---------- Tabor	40	---	1,000	---	20	---	---	---	6.0	---	5.0	---
TeC, TeD---------- Tremona	40	---	1,200	---	---	---	---	---	7.0	---	6.0	---
Tr---------- Trinity	50	---	---	---	---	---	---	---	8.0	---	---	---
Wa---------- Waller	---	---	---	---	---	---	---	---	---	---	---	---
WlA---------- Wilson	45	---	---	---	20	---	---	---	6.0	---	4.0	---
WlB---------- Wilson	35	---	---	---	20	---	---	---	6.0	---	4.0	---
WoA, WoB---------- Wockley	90	---	2,000	---	30	---	---	100	10.0	---	8.0	---

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

TABLE 6.--RANGELAND PRODUCTIVITY

[Only the soils that support rangeland vegetation suitable for grazing are listed]

Soil name and map symbol	Range site	Potential annual production for kind of growing season		
		Favorable	Average	Unfavorable
		Lb/acre	Lb/acre	Lb/acre
ArA---- Aris	Loamy Prairie----	8,500	6,500	5,000
AxC, AxC2, AxD---- Axtell	Claypan Savannah----	5,000	3,500	2,500
BbB---- Bleiblerville	Blackland (Blackland Prairie)----	7,500	6,000	4,500
Be---- Bosque	Loamy Bottomland----	6,500	5,000	3,500
BrA, BrB---- Brazoria	Clayey Bottomland----	8,000	6,000	4,000
Bs---- Brazoria	Clayey Bottomland----	8,000	6,500	4,000
BtD---- Brenham	Clay Loam----	6,500	4,500	3,000
BuA---- Burleson	Blackland (Blackland Prairie)----	7,000	5,500	4,000
CaB, CaC, CaD---- Carbengle	Clay Loam----	6,000	4,000	2,500
CcD---- Catilla	Deep Sand Savannah----	4,500	3,500	2,000
ChC, ChD---- Chazos	Loamy Sand----	5,500	4,500	3,000
Cm---- Clemville	Loamy Bottomland----	7,000	6,000	4,000
CrC---- Crockett	Claypan Prairie----	6,000	5,000	3,000
CrC2---- Crockett	Claypan Prairie----	6,000	5,000	3,000
CrD---- Crockett	Claypan Prairie----	6,000	5,000	3,000
CuB, CuC, CuD---- Cuero	Clay Loam----	6,500	5,000	3,000
DuD---- Dutek	Sandy----	5,000	4,500	2,500
EdA, EdB---- Edna	Claypan Prairie----	6,000	5,000	3,000
EuC---- Eufaula	Deep Sand----	4,000	2,800	2,000
FrB, FrC, FrD---- Frelsburg	Blackland (Blackland Prairie)----	7,500	6,000	4,500
HoB, HoC, HpC---- Hockley	Loamy Prairie----	8,500	6,000	5,000

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY--Continued

Soil name and map symbol	Range site	Potential annual production for kind of growing season		
		Favorable	Average	Unfavorable
		Lb/acre	Lb/acre	Lb/acre
KaA, KaB---------- Katy	Loamy Prairie----------	8,500	6,500	5,000
KcB*:				
Katy----------	Loamy Prairie----------	8,500	6,500	5,000
Edna----------	Claypan Prairie----------	6,000	5,000	3,000
KeD---------- Kenney	Sandy Prairie----------	8,000	6,000	5,000
KlC, KlD---------- Klump	Sandy Loam----------	6,500	5,000	3,000
KnC---------- Knolle	Sandy Loam----------	6,500	5,000	3,000
KuC---------- Kuy	Deep Sand----------	4,500	3,000	2,000
KyB*:				
Kuy----------	Deep Sand----------	4,500	3,000	2,000
Aris----------	Loamy Prairie----------	8,500	6,500	5,000
LaA, LaB, LaD---------- Lake Charles	Blackland (Coast Prairie)----------	8,000	6,000	5,000
LtC, LtE---------- Latium	Eroded Blackland----------	6,500	5,000	4,000
LuA, LuB---------- Lufkin	Claypan Prairie----------	5,000	4,000	2,500
MaA, MaB---------- Mabank	Claypan Prairie----------	6,000	5,000	3,000
MdA, MdB---------- Midland	Blackland (Coast Prairie)----------	6,000	5,000	3,000
Mp---------- Midland	Lowland----------	7,500	5,500	4,000
MvC---------- Monaville	Sandy Prairie----------	8,000	6,500	5,000
Na---------- Nahatche	Loamy Bottomland----------	6,500	5,000	3,000
NeC---------- Newulm	Sandy----------	4,000	3,000	2,000
NoA, NrA---------- Norwood	Loamy Bottomland----------	7,000	6,000	4,000
OkA---------- Oklared	Loamy Bottomland----------	7,000	6,000	4,000
On*:				
Oklared----------	Loamy Bottomland----------	7,000	6,000	4,000
Norwood----------	Loamy Bottomland----------	7,000	6,000	4,000
RaA, RaB---------- Rader	Sandy Loam----------	6,000	4,500	3,500
ReF---------- Renish	Chalky Ridge----------	3,000	2,000	1,000

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY--Continued

Soil name and map symbol	Range site	Potential annual production for kind of growing season		
		Favorable	Average	Unfavorable
		Lb/acre	Lb/acre	Lb/acre
SeC---------- Sealy	Wet Sandy Draw----------	4,500	4,000	3,500
SlC, SlD---------- Silawa	Loamy Sand----------	6,000	5,000	3,000
SrC, SrD---------- Straber	Loamy sand----------	5,500	4,500	3,000
StC---------- Styx	Sandy----------	6,000	5,500	3,500
Su---------- Sumpf	Clayey Bottomland----------	5,000	4,500	3,000
TaC---------- Tabor	Sandy Loam----------	6,500	5,000	3,500
TeC, TeD---------- Tremona	Sandy----------	5,000	3,500	2,500
Tr---------- Trinity	Clayey Bottomland----------	7,500	5,000	4,000
Wa---------- Waller	Loamy Prairie----------	8,000	7,000	5,000
WlA, WlB---------- Wilson	Claypan Prairie----------	6,000	5,000	3,000
WoA, WoB---------- Wockley	Loamy Prairie----------	8,500	7,000	5,500

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	
AnA, AnC---------- Annona	4c	Slight	Moderate	Slight	Slight	Loblolly pine-------	74	Loblolly pine, slash pine.
						Shortleaf pine------	65	
						Southern red oak----	65	
BoC---------- Boy	2s	Slight	Slight	Moderate	Slight	Loblolly pine-------	87	Loblolly pine, slash pine.
						Shortleaf pine------	75	
						Longleaf pine-------	80	
BrA, BrB, Bs------- Brazoria	5w	Slight	Severe	Severe	Moderate	Pecan---------------	---	Pecan, green ash.
						Water oak-----------	---	
						Green ash-----------	50	
						Hackberry-----------	50	
Cm---------- Clemville	2o	Slight	Slight	Slight	Slight	Eastern cottonwood--	100	Eastern cottonwood, black walnut, pecan, bur oak, green ash.
						Pecan---------------	---	
						Green ash-----------	---	
						Black walnut--------	---	
CoC---------- Conroe	3s	Slight	Moderate	Moderate	Slight	Loblolly pine-------	78	Loblolly pine, slash pine.
						Shortleaf pine------	66	
CpC*---------- Conroe	4c	Moderate	Moderate	Moderate	Slight	Loblolly pine-------	70	Loblolly pine.
						Shortleaf pine------	60	
DeC---------- Depcor	3s	Slight	Moderate	Moderate	Slight	Loblolly pine-------	80	Loblolly pine, slash pine.
						Shortleaf pine------	74	
						Southern red oak----	---	
FeC---------- Fetzer	3w	Slight	Moderate	Moderate	Slight	Loblolly pine-------	80	Loblolly pine, shortleaf pine.
						Shortleaf pine------	70	
HoB, HoC, HpC------ Hockley	2o	Slight	Slight	Slight	Slight	Loblolly pine-------	90	Loblolly pine, slash pine, sweetgum, black walnut.
						Water oak-----------	90	
						Sweetgum------------	90	
						Southern red oak----	80	
LdC---------- Landman	2s	Slight	Moderate	Moderate	Slight	Loblolly pine-------	88	Loblolly pine, slash pine.
						Shortleaf pine------	80	
LlE*:								
Landman----------	2s	Slight	Moderate	Moderate	Slight	Loblolly pine-------	88	Loblolly pine, slash pine.
						Shortleaf pine------	80	
Larue----------	3s	Slight	Moderate	Moderate	Moderate	Loblolly pine-------	80	Loblolly pine, shortleaf pine.
						Shortleaf pine------	70	
						Longleaf pine-------	70	
Na---------- Nahatche	4w	Slight	Severe	Moderate	Slight	Water oak-----------	70	Water oak.
						Willow oak----------	70	
NoA, NrA---------- Norwood	2o	Slight	Slight	Slight	Slight	Eastern cottonwood--	100	Eastern cottonwood.
OkA---------- Oklared	20	Slight	Slight	Slight	Moderate	Eastern cottonwood--	100	Eastern cottonwood, American sycamore, pecan, black walnut, sweetgum.
						Pecan---------------	75	
						Hackberry-----------	75	

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	
On*:								
Oklared	20	Slight	Slight	Slight	Moderate	Eastern cottonwood	100	Eastern cottonwood, American sycamore, pecan, black walnut, sweetgum.
						Pecan	75	
						Hackberry	75	
Norwood	2o	Slight	Slight	Slight	Slight	Eastern cottonwood	100	Eastern cottonwood.
SgC	2o	Slight	Slight	Slight	Slight	Loblolly pine	90	Loblolly pine, slash pine, sweetgum.
Segno						Longleaf pine	77	
						Shortleaf pine	80	
						Sweetgum	90	
						Southern red oak	80	
SpB	2w	Slight	Moderate	Moderate	Moderate	Loblolly pine	94	Loblolly pine, slash pine, southern red oak.
Splendora						Shortleaf pine	80	
						Water oak	90	
						Sweetgum	90	
Tr	4w	Slight	Moderate	Slight	Severe	Green ash	70	Green ash, water oak, pecan.
Trinity						Water oak	70	

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--WOODLAND UNDERSTORY VEGETATION

[Only the soils suitable for production of commercial trees are listed. Soils that support mainly rangeland vegetation are listed in table 6]

Soil name and map symbol	Total production		Characteristic vegetation	Composition
	Kind of year	Dry weight		
		Lb/acre		Pct
AnA, AnC---------- Annona	Favorable	2,500	Little bluestem----------	15
	Normal	2,000	Brownseed paspalum----------	15
	Unfavorable	1,000	Panicum----------	15
			Indiangrass----------	10
			Longleaf uniola----------	10
			Purpletop----------	5
BoC---------- Boy	Favorable	2,000	Pinehill bluestem----------	20
	Normal	1,500	Hairy panicum----------	15
	Unfavorable	1,000	Longleaf uniola----------	15
			Purpletop----------	10
			American beautyberry----------	10
			Indiangrass----------	5
			Greenbrier----------	5
CoC---------- Conroe	Favorable	1,500	Pinehill bluestem----------	20
	Normal	1,250	Longleaf uniola----------	10
	Unfavorable	500	Purpletop----------	10
			Panicum----------	10
			American beautyberry----------	10
			Indiangrass----------	5
			Sedge----------	5
CpC*---------- Conroe	Favorable	1,000	Sedge----------	25
	Normal	650	Pinehill bluestem----------	20
	Unfavorable	300	Brownseed paspalum----------	15
			Panicum----------	10
			Longleaf uniola----------	10
DeC---------- Depcor	Favorable	3,500	Pinehill bluestem----------	30
	Normal	2,500	Indiangrass----------	10
	Unfavorable	1,500	Longleaf uniola----------	10
			Panicum----------	10
			Sedge----------	10
			Switchgrass----------	5
			Purpletop----------	5
			Purple lovegrass----------	5
FeC---------- Fetzer	Favorable	3,500	Pinehill bluestem----------	30
	Normal	2,500	Indiangrass----------	10
	Unfavorable	1,500	Longleaf uniola----------	10
			Panicum----------	10
			Sedge----------	10
			Switchgrass----------	5
			Purpletop----------	5
LdC---------- Landman	Favorable	2,000	Pinehill bluestem----------	20
	Normal	1,500	Panicum----------	15
	Unfavorable	1,000	Longleaf uniola----------	15
			Purpletop----------	10
			American beautyberry----------	10
			Indiangrass----------	5
			Sedge----------	5

See footnote at end of table.

TABLE 8.--WOODLAND UNDERSTORY VEGETATION--Continued

Soil name and map symbol	Total production		Characteristic vegetation	Composition
	Kind of year	Dry weight		
		Lb/acre		Pct
L1E*:				
Landman	Favorable	2,000	Pinehill bluestem	20
	Normal	1,500	Panicum	15
	Unfavorable	1,000	Longleaf uniola	15
			Purpletop	10
			American beautyberry	10
			Indiangrass	5
			Sedge	5
Larue	Favorable	4,500	Pinehill bluestem	20
	Normal	3,000	Indiangrass	10
	Unfavorable	2,000	Longleaf uniola	10
			Switchgrass	10
			Purpletop	5
			Purple lovegrass	5
			Splitbeard bluestem	5
			Brownseed paspalum	5
Na	Favorable	3,000	Hairy wildrye	20
Nahatche	Normal	2,000	Hairy panicum	15
	Unfavorable	1,500	Rustyseed paspalum	15
			Panicum	10
			Bentawn plumegrass	5
			Switchcane	5
SgC	Favorable	2,300	Pinehill bluestem	45
Segno	Normal	1,800	Longleaf uniola	10
	Unfavorable	1,400	Indiangrass	5
			Purpletop	5
			Panicum	5
			Sedge	5
			American beautyberry	5
			Yaupon	5
SpB	Favorable	2,300	Pinehill bluestem	35
Splendora	Normal	1,800	Beaked panicum	10
	Unfavorable	1,400	Longleaf uniola	10
			Sedge	10
			Yaupon	10
			American beautyberry	5

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
AnA, AnC Annona	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Severe: erodes easily.	Slight.
ArA Aris	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
AxC, AxC2 Axtell	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Severe: erodes easily.	Slight.
AxD Axtell	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Severe: erodes easily.	Slight.
BbB Bleiblerville	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Severe: too clayey.	Moderate: too clayey.	Severe: too clayey.
Be Bosque	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
BoC Boy	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty, too sandy.
BrA, BrB Brazoria	Severe: flooding, wetness, percs slowly.	Severe: too clayey, percs slowly.	Severe: too clayey, wetness.	Severe: too clayey.	Severe: too clayey.
Bs Brazoria	Severe: flooding, ponding, percs slowly.	Severe: ponding, too clayey, percs slowly.	Severe: ponding, too clayey, percs slowly.	Severe: ponding, too clayey.	Severe: ponding, too clayey.
BtD Brenham	Slight	Slight	Moderate: slope.	Slight	Slight.
BuA Burleson	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: small stones, too clayey.	Moderate: too clayey.	Severe: too clayey.
CaB, CaC Carbengle	Slight	Slight	Moderate: slope, depth to rock, small stones.	Slight	Moderate: thin layer.
CaD Carbengle	Slight	Slight	Severe: slope.	Slight	Moderate: thin layer.
CcD Catilla	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty.
ChC Chazos	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones.	Moderate: too sandy.	Moderate: too sandy.
ChD Chazos	Moderate: too sandy.	Moderate: too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: too sandy.
Cm Clemville	Severe: flooding.	Moderate: percs slowly.	Moderate: flooding, percs slowly.	Severe: erodes easily.	Moderate: flooding.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
CoC---------- Conroe	Moderate: wetness, too sandy.	Moderate: wetness, too sandy.	Moderate: slope, small stones, too sandy.	Moderate: too sandy.	Moderate: droughty, too sandy.
CpC*---------- Conroe	Severe: small stones.	Severe: small stones.	Severe: small stones.	Slight----------	Severe: small stones.
CrC, CrC2---------- Crockett	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Severe: erodes easily.	Slight.
CrD---------- Crockett	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Severe: erodes easily.	Slight.
CuB, CuC---------- Cuero	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
CuD---------- Cuero	Slight----------	Slight----------	Severe: slope.	Slight----------	Slight.
DeC---------- Depcor	Moderate: wetness, percs slowly, too sandy.	Moderate: wetness, percs slowly, too sandy.	Moderate: slope, wetness, too sandy.	Moderate: too sandy.	Moderate: droughty, too sandy.
DuD---------- Dutek	Moderate: too sandy.	Moderate: too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty, too sandy.
EdA, EdB---------- Edna	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
EuC---------- Eufaula	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
FeC---------- Fetzer	Moderate: wetness, percs slowly, too sandy.	Moderate: wetness, too sandy, percs slowly.	Moderate: slope, too sandy, wetness.	Moderate: wetness, too sandy.	Moderate: wetness, too sandy.
FrB, FrC---------- Frelsburg	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: too clayey, percs slowly, slope.	Moderate: too clayey.	Severe: too clayey.
FrD---------- Frelsburg	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Severe: slope, too clayey.	Moderate: too clayey.	Severe: too clayey.
HoB, HoC---------- Hockley	Slight----------	Slight----------	Moderate: small stones.	Slight----------	Slight.
HpC, HzC*---------- Hockley	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight----------	Moderate: small stones.
KaA, KaB---------- Katy	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, erodes easily.	Severe: wetness.
KcB*: Katy----------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, erodes easily.	Severe: wetness.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
KcB*: Edna	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
KeD: Kenney	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty, too sandy.
KlC: Klump	Slight	Slight	Moderate: slope.	Slight	Slight.
KlD: Klump	Slight	Slight	Severe: slope.	Slight	Slight.
KnC: Knolle	Slight	Slight	Moderate: slope.	Slight	Slight.
KuC: Kuy	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty, too sandy.
KyB*: Kuy	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty, too sandy.
Aris	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
LaA, LaB: Lake Charles	Severe: wetness, percs slowly, too clayey.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey, wetness, percs slowly.	Severe: wetness, too clayey.	Severe: wetness, too clayey.
LaD: Lake Charles	Severe: wetness, percs slowly, too clayey.	Severe: wetness, too clayey, percs slowly.	Severe: slope, too clayey, wetness.	Severe: wetness, too clayey.	Severe: wetness, too clayey.
LdC: Landman	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty, too sandy.
LlE*: Landman	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy	Moderate: droughty, too sandy.
Larue	Moderate: too sandy.	Moderate: too sandy.	Severe: slope.	Slight	Moderate: droughty.
LtC: Latium	Moderate: too clayey, percs slowly.	Moderate: too clayey, percs slowly.	Moderate: too clayey, percs slowly, slope.	Moderate: too clayey.	Severe: too clayey.
LtE: Latium	Moderate: too clayey, percs slowly, slope.	Moderate: too clayey, slope, percs slowly.	Severe: slope, too clayey.	Moderate: too clayey.	Severe: too clayey.
LuA, LuB: Lufkin	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, erodes easily.	Severe: wetness.
MaA, MaB: Mabank	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
MdA, MdB---------- Midland	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, erodes easily.	Severe: wetness.
Mp---------- Midland	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.
MvC---------- Monaville	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.	Moderate: droughty, too sandy.
Na---------- Nahatche	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
NeC---------- Newulm	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.	Moderate: droughty, too sandy.
NoA, NrA---------- Norwood	Severe: flooding.	Slight----------	Slight----------	Slight----------	Slight.
OkA---------- Oklared	Severe: flooding.	Slight----------	Slight----------	Slight----------	Slight.
On*: Oklared----------	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
Norwood----------	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
RaA---------- Rader	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Slight----------	Slight.
RaB---------- Rader	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight----------	Slight.
ReF---------- Renish	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: erodes easily.	Severe: thin layer.
SeC---------- Sealy	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
SgC---------- Segno	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight----------	Slight.
SlC---------- Silawa	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.	Moderate: too sandy.
SlD---------- Silawa	Moderate: too sandy.	Moderate: too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: too sandy.
SpB---------- Splendora	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, erodes easily.	Severe: wetness.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
SrC---------- Straber	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
SrD---------- Straber	Slight----------	Slight----------	Severe: slope.	Slight----------	Slight.
StC---------- Styx	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty, too sandy.
Su---------- Sumpf	Severe: flooding, ponding, percs slowly.	Severe: ponding, too clayey, percs slowly.	Severe: too clayey, ponding, flooding.	Severe: ponding, too clayey.	Severe: ponding, flooding, too clayey.
TaC---------- Tabor	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones, percs slowly.	Severe: erodes easily.	Slight.
TeC, TeD---------- Tremona	Moderate: wetness, percs slowly, too sandy.	Moderate: wetness, percs slowly, too sandy.	Moderate: slope, small stones, too sandy.	Moderate: wetness, small stones, too sandy.	Moderate: wetness, droughty.
Tr---------- Trinity	Severe: flooding, wetness, percs slowly.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey, wetness, flooding.	Severe: wetness, too clayey.	Severe: wetness, flooding, too clayey.
Wa---------- Waller	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
WlA, WlB---------- Wilson	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, erodes easily.	Severe: wetness.
WoA, WoB---------- Wockley	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
AnA---- Annona	Fair	Good	Good	Good	Good	---	Fair	Fair	Good	Good	Fair	---
AnC---- Annona	Fair	Good	Good	Good	Good	---	Poor	Poor	Good	Good	Poor	---
ArA---- Aris	Fair	Fair	Good	Fair	Fair	Poor	Good	Good	Fair	Fair	Good	Fair.
AxC, AxC2---- Axtell	Fair	Fair	Good	Good	---	Good	Poor	Very poor.	Fair	Good	Very poor.	Good.
AxD---- Axtell	Poor	Fair	Good	Good	---	Good	Poor	Very poor.	Fair	Good	Very poor.	Good.
BbB---- Bleiblerville	Good	Good	Fair	---	---	Fair	Poor	Poor	Good	---	Poor	Fair.
Be---- Bosque	Very poor.	Poor	Fair	---	---	Good	Poor	Very poor.	Poor	---	Very poor.	Fair.
BoC---- Boy	Fair	Good	Good	Fair	Fair	---	Poor	Poor	Good	Fair	Poor	---
BrA, BrB---- Brazoria	Fair	Fair	Fair	Good	---	Fair	Poor	Fair	Fair	Good	Poor	Fair.
Bs---- Brazoria	Poor	Fair	Fair	Good	---	Fair	Fair	Good	Fair	Good	Fair	Fair.
BtD---- Brenham	Fair	Good	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
BuA---- Burleson	Good	Good	Poor	---	---	Poor	Very poor.	Very poor.	Fair	---	Very poor.	Poor.
CaB, CaC, CaD---- Carbengle	Fair	Good	Good	---	---	Fair	Poor	Very poor.	Good	---	Very poor.	Fair.
CcD---- Catilla	Fair	Good	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
ChC, ChD---- Chazos	Fair	Good	Good	---	---	Good	Poor	Very poor.	Good	---	Very poor.	Good.
Cm---- Clemville	Good	Good	Fair	Good	---	Fair	Poor	Very poor.	Good	Good	Very poor.	Fair.
CoC, CpC*---- Conroe	Poor	Fair	Good	Fair	Fair	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
CrC, CrC2---- Crockett	Fair	Good	Good	Good	---	Good	Poor	Poor	Good	---	Poor	Good.
CrD---- Crockett	Poor	Fair	Good	Good	---	Good	Poor	Very poor.	Fair	---	Very poor.	Good.
CuB, CuC, CuD---- Cuero	Good	Good	Good	---	---	Fair	Poor	Poor	Good	---	Poor	Fair.
DeC---- Depcor	Poor	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
DuD---- Dutek	Poor	Fair	Good	Fair	---	Good	Very poor.	Very poor.	Fair	Fair	Very poor.	Good.
EdA---- Edna	Fair	Fair	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good	Poor.
EdB---- Edna	Fair	Fair	Fair	Fair	Fair	Poor	Good	Fair	Fair	Fair	Fair	Poor.
EuC---- Eufaula	Poor	Fair	Fair	Fair	Fair	Good	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
FeC---- Fetzer	Fair	Fair	Good	Good	Good	---	Poor	Very poor.	Fair	Good	Very poor.	---
FrB---- Frelsburg	Good	Good	Fair	---	---	Fair	Poor	Very poor.	Good	---	Very poor.	Fair.
FrC, FrD---- Frelsburg	Fair	Good	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
HoB, HoC, HpC---- Hockley	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good.
HzC*. Hockley												
KaA, KaB---- Katy	Fair	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair	Good.
KcB*:												
Katy----	Fair	Good	Good	Good	Good	---	Fair	Fair	Good	Good	Fair	Good.
Edna----	Fair	Fair	Fair	Fair	Fair	Poor	Good	Fair	Fair	Fair	Fair	Poor.
KeD---- Kenney	Poor	Fair	Good	Good	Good	Fair	Poor	Very poor.	Fair	Good	Very poor.	Fair.
KlC, KlD---- Klump	Fair	Good	Good	---	---	Good	Poor	Very poor.	Good	---	Very poor.	Good.
KnC---- Knolle	Fair	Fair	Good	---	---	Good	Poor	Very poor.	Fair	---	Very poor.	Good.
KuC---- Kuy	Fair	Good	Fair	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
KyB*:												
Kuy----	Fair	Good	Fair	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
Aris----	Fair	Fair	Good	Fair	Fair	Poor	Good	Good	Fair	Fair	Good	Fair.
LaA---- Lake Charles	Fair	Fair	Fair	Good	Good	Poor	Fair	Good	Fair	Good	Fair	Poor.
LaB---- Lake Charles	Fair	Fair	Fair	Good	Good	Poor	Fair	Poor	Fair	Good	Poor	Poor.
LaD---- Lake Charles	Fair	Fair	Fair	Good	Good	Poor	Poor	Very poor.	Fair	Good	Poor	Poor.
LdC---- Landman	Poor	Fair	Good	Good	Good	---	Poor	Poor	Fair	Good	Poor	---
LlE*:												
Landman----	Poor	Fair	Good	Good	Good	---	Poor	Poor	Fair	Good	Poor	---

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
LlE*: Larue	Poor	Fair	Good	Good	Good	---	Poor	Very poor.	Fair	Good	Very poor.	---
LtC Latium	Fair	Good	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
LtE Latium	Poor	Fair	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
LuA, LuB Lufkin	Fair	Good	Fair	Good	Good	Poor	Fair	Fair	Fair	Good	Fair	Poor.
MaA, MaB Mabank	Fair	Good	Good	Good	---	Fair	Fair	Fair	Good	---	Fair	Fair.
MdA, MdB, Mp Midland	Poor	Fair	Fair	Fair	---	Poor	Good	Good	Fair	Fair	Good	Poor.
MvC Monaville	Poor	Fair	Good	---	---	Good	Poor	Very poor.	Fair	---	Very poor.	Good.
Na Nahatche	Fair	Fair	Fair	Good	Fair	---	Poor	Fair	Fair	Good	Poor	---
NeC Newulm	Fair	Good	Good	---	---	Good	Very poor.	Very poor.	Good	---	Very poor.	Good.
NoA, NrA Norwood	Good	Good	Fair	---	---	Fair	Poor	Very poor.	Good	---	Very poor.	Fair.
OkA Oklared	Good	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.	Good.
On*: Oklared	Good	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.	Good.
Norwood	Good	Good	Fair	---	---	Fair	Poor	Very poor.	Good	---	Very poor.	Fair.
RaA, RaB Rader	Fair	Good	Good	Good	---	Good	Poor	Poor	Good	---	Poor	Good.
ReF Renish	Poor	Poor	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
SeC Sealy	Poor	Fair	Fair	---	---	Fair	Good	Poor	Fair	---	Good	Poor.
SgC Segno	Good	Good	Good	Good	Good	---	Poor	Poor	Good	Good	Poor	---
SlC, SlD Silawa	Fair	Good	Good	---	---	Good	Poor	Very poor.	Good	---	Very poor.	Good.
SpB Splendora	Fair	Good	Good	Good	Good	---	Poor	Poor	Good	Good	Poor	---
SrC, SrD Straber	Fair	Good	Good	---	---	Good	Poor	Poor	Good	---	Poor	Good.
StC Styx	Fair	Fair	Good	Fair	---	Good	Poor	Very poor.	Fair	---	Very poor.	Good.
Su Sumpf	Very poor.	Poor	Poor	Poor	---	Poor	Good	Good	Poor	---	Good	Poor.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
TaC---------- Tabor	Fair	Good	Good	---	---	Good	Very poor.	Very poor.	Good	---	Very poor.	Good.
TeC, TeD---------- Tremona	Fair	Good	Good	---	---	Good	Very poor.	Very poor.	Good	---	Very poor.	Good.
Tr---------- Trinity	Poor	Fair	Fair	Good	---	Fair	Poor	Fair	Fair	Fair	Poor	Fair.
Wa---------- Waller	Very poor.	Poor	Poor	Very poor.	Very poor.	Poor	Good	Good	Poor	Very poor.	Good	Poor.
W1A, W1B---------- Wilson	Fair	Fair	Good	---	---	Fair	Fair	Fair	Fair	---	Fair	Fair.
WoA, WoB---------- Wockley	Fair	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair	Good.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
AnA, AnC---------- Annona	Severe: wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
ArA---------- Aris	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
AxC, AxC2, AxD---- Axtell	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
BbB---------- Bleiblerville	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
Be---------- Bosque	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Severe: flooding.
BoC---------- Boy	Severe: cutbanks cave.	Slight---------	Moderate: wetness.	Slight---------	Slight---------	Moderate: droughty, too sandy.
BrA, BrB---------- Brazoria	Severe: cutbanks cave, wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, shrink-swell.	Severe: too clayey.
Bs---------- Brazoria	Severe: cutbanks cave, wetness.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: low strength, shrink-swell, ponding.	Severe: too clayey, ponding.
BtD---------- Brenham	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
BuA---------- Burleson	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Severe: too clayey.
CaB---------- Carbengle	Moderate: depth to rock.	Slight---------	Moderate: depth to rock.	Slight---------	Moderate: low strength.	Moderate: thin layer.
CaC, CaD---------- Carbengle	Moderate: depth to rock.	Slight---------	Moderate: depth to rock.	Moderate: slope.	Moderate: low strength.	Moderate: thin layer.
CcD---------- Catilla	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty, too sandy.
ChC---------- Chazos	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Moderate: too sandy.
ChD---------- Chazos	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Moderate: too sandy.
Cm---------- Clemville	Moderate: too clayey, flooding.	Severe: flooding.	Severe: flooding, shrink-swell.	Severe: flooding.	Severe: low strength, flooding.	Moderate: flooding.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
CoC---------- Conroe	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: droughty, too sandy.
CpC*---------- Conroe	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: low strength.	Severe: small stones.
CrC, CrC2, CrD---- Crockett	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
CuB---------- Cuero	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.	Slight.
CuC, CuD---------- Cuero	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength, shrink-swell.	Slight.
DeC---------- Depcor	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: droughty, too sandy.
DuD---------- Dutek	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Moderate: droughty, too sandy.
EdA, EdB---------- Edna	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
EuC---------- Eufaula	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty, too sandy.
FeC---------- Fetzer	Severe: cutbanks cave.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Moderate: wetness.	Moderate: wetness, too sandy.
FrB, FrC, FrD----- Frelsburg	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
HoB, HoC---------- Hockley	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
HpC, HzC*--------- Hockley	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Moderate: small stones.
KaA, KaB---------- Katy	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
KcB*: Katy----------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Edna----------	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
KeD---------- Kenney	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Moderate: droughty, too sandy.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
KlC, KlD---------- Klump	Slight---------	Slight---------	Slight---------	Moderate: slope.	Slight---------	Slight.
KnC---------- Knolle	Slight---------	Slight---------	Slight---------	Slight---------	Slight---------	Slight.
KuC---------- Kuy	Severe: cutbanks cave.	Slight---------	Moderate: wetness.	Slight---------	Slight---------	Moderate: droughty, too sandy.
KyB*:						
Kuy----------	Severe: cutbanks cave.	Slight---------	Moderate: wetness.	Slight---------	Slight---------	Moderate: droughty, too sandy.
Aris----------	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
LaA, LaB, LaD----- Lake Charles	Severe: cutbanks cave, wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness, too clayey.
LdC---------- Landman	Severe: cutbanks cave.	Slight---------	Moderate: wetness.	Slight---------	Slight---------	Moderate: droughty, too sandy.
LlE*:						
Landman----------	Severe: cutbanks cave.	Slight---------	Moderate: wetness.	Moderate: slope.	Slight---------	Moderate: droughty, too sandy.
Larue----------	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Moderate: droughty, too sandy.
LtC---------- Latium	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
LtE---------- Latium	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Severe: too clayey.
LuA, LuB---------- Lufkin	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
MaA, MaB---------- Mabank	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
MdA, MdB---------- Midland	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
Mp---------- Midland	Severe: wetness.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, shrink-swell.	Severe: ponding.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
MvC---------- Monaville	Moderate: wetness.	Slight---------	Moderate: wetness, shrink-swell.	Slight---------	Severe: low strength.	Moderate: droughty, too sandy.
Na---------- Nahatche	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.
NeC---------- Newulm	Slight---------	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty, too sandy.
NoA, NrA---------- Norwood	Slight---------	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength.	Slight.
OkA---------- Oklared	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Slight.
On*:						
Oklared----------	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
Norwood----------	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Severe: flooding.
RaA, RaB---------- Rader	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Moderate: wetness, shrink-swell.	Severe: low strength.	Slight.
ReF---------- Renish	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: thin layer.
SeC---------- Sealy	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
SgC---------- Segno	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Slight.
SlC---------- Silawa	Slight---------	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: too sandy.
SlD---------- Silawa	Slight---------	Slight---------	Slight---------	Moderate: slope.	Slight---------	Moderate: too sandy.
SpB---------- Splendora	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
SrC---------- Straber	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
SrD---------- Straber	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
StC---------- Styx	Severe: cutbanks cave.	Slight---------	Moderate: wetness.	Slight---------	Slight---------	Moderate: droughty, too sandy.
Su---------- Sumpf	Severe: ponding.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: ponding, low strength, flooding.	Severe: ponding, flooding, too clayey.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
TaC---------- Tabor	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
TeC, TeD---------- Tremona	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness, shrink-swell.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness, droughty, too sandy.
Tr---------- Trinity	Severe: cutbanks cave, wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding, too clayey.
Wa---------- Waller	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
W1A, W1B---------- Wilson	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
WoA, WoB---------- Wockley	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness.	Severe: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
AnA Annona	Severe: percs slowly, wetness.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
AnC Annona	Severe: percs slowly, wetness.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
ArA Aris	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
AxC, AxC2, AxD Axtell	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
BbB Bleiblerville	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Be Bosque	Severe: flooding.	Moderate: seepage.	Severe: flooding.	Severe: flooding.	Fair: too clayey.
BoC Boy	Severe: wetness, percs slowly, poor filter.	Severe: seepage.	Moderate: wetness, too sandy.	Severe: seepage.	Fair: too sandy.
BrA Brazoria	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
BrB Brazoria	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Bs Brazoria	Severe: ponding, percs slowly.	Slight	Severe: ponding. too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
BtD Brenham	Moderate: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
BuA Burleson	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
CaB, CaC, CaD Carbengle	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
CcD Catilla	Severe: poor filter.	Severe: seepage.	Moderate: too sandy.	Severe: seepage.	Poor: seepage.
ChC, ChD Chazos	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Cm Clemville	Severe: flooding, percs slowly.	Slight	Severe: flooding, too clayey.	Severe: flooding.	Poor: too clayey, hard to pack.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
CoC---------- Conroe	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Moderate: wetness, too clayey.	Severe: seepage.	Fair: too clayey, hard to pack.
CpC*---------- Conroe	Severe: wetness, percs slowly.	Severe: wetness.	Moderate: wetness, too clayey.	Moderate: wetness.	Fair: too clayey, hard to pack.
CrC, CrC2, CrD------ Crockett	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight----------	Poor: too clayey, hard to pack.
CuB, CuC, CuD------- Cuero	Slight----------	Moderate: seepage, slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
DeC---------- Depcor	Severe: wetness, percs slowly, poor filter.	Severe: wetness.	Moderate: wetness, too clayey.	Severe: seepage.	Fair: too clayey, wetness.
DuD---------- Dutek	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage.
EdA---------- Edna	Severe: wetness, percs slowly.	Slight----------	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
EdB---------- Edna	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
EuC---------- Eufaula	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.
FeC---------- Fetzer	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey.
FrB, FrC, FrD------- Frelsburg	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight----------	Poor: too clayey, hard to pack.
HoB, HoC, HpC------- Hockley	Severe: wetness, percs slowly.	Moderate: seepage, wetness.	Moderate: wetness, too clayey.	Severe: seepage.	Fair: too clayey.
HzC*---------- Hockley	Severe: wetness, percs slowly.	Moderate: seepage, slope, wetness.	Moderate: wetness, too clayey.	Slight----------	Fair: too clayey.
KaA, KaB---------- Katy	Severe: wetness, percs slowly.	Slight----------	Severe: wetness.	Severe: wetness.	Poor: wetness.
KcB*:					
Katy----------	Severe: wetness, percs slowly.	Slight----------	Severe: wetness.	Severe: wetness.	Poor: wetness.
Edna----------	Severe: wetness, percs slowly.	Slight----------	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
KeD---------- Kenney	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage.
KlC, KlD---------- Klump	Slight----------	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
KnC---------- Knolle	Slight----------	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
KuC---------- Kuy	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Fair: too sandy, wetness.
KyB*:					
Kuy----------	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Fair: too sandy, wetness.
Aris----------	Severe: wetness, percs slowly.	Slight----------	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
LaA---------- Lake Charles	Severe: wetness, percs slowly.	Slight----------	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
LaB, LaD---------- Lake Charles	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
LdC---------- Landman	Severe: poor filter.	Severe: seepage.	Moderate: too sandy.	Severe: seepage.	Fair: too sandy.
LlE*:					
Landman----------	Severe: poor filter.	Severe: seepage.	Moderate: too sandy.	Severe: seepage.	Fair: too sandy.
Larue----------	Severe: poor filter.	Severe: seepage, slope.	Slight----------	Severe: seepage.	Good.
LtC---------- Latium	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight----------	Poor: too clayey, hard to pack.
LtE---------- Latium	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
LuA---------- Lufkin	Severe: wetness, percs slowly.	Slight----------	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
LuB---------- Lufkin	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
MaA, MaB---------- Mabank	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
MdA, MdB---------- Midland	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Mp---------- Midland	Severe: ponding, percs slowly.	Slight----------	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
MvC---------- Monaville	Severe: percs slowly.	Severe: seepage, wetness.	Slight----------	Slight----------	Good.
Na---------- Nahatche	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
NeC---------- Newulm	Severe: percs slowly.	Severe: seepage.	Slight----------	Severe: seepage.	Good.
NoA, NrA---------- Norwood	Moderate: flooding, percs slowly.	Moderate: seepage.	Moderate: flooding, too clayey.	Moderate: flooding.	Fair: too clayey.
OkA---------- Oklared	Severe: wetness.	Severe: seepage, flooding.	Severe: seepage, wetness.	Severe: seepage.	Good.
On*: Oklared----------	Severe: flooding, wetness.	Severe: seepage, flooding.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage.	Good.
Norwood----------	Severe: flooding.	Moderate: seepage.	Severe: flooding.	Severe: flooding.	Fair: too clayey.
RaA---------- Rader	Severe: wetness, percs slowly.	Slight----------	Severe: too clayey.	Moderate: wetness.	Moderate: too clayey, wetness.
RaB---------- Rader	Severe: wetness, percs slowly.	Moderate: slope.	Severe: too clayey.	Moderate: wetness.	Moderate: too clayey, wetness.
ReF---------- Renish	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
SeC---------- Sealy	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage, wetness.	Poor: wetness.
SgC---------- Segno	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: seepage.	Severe: seepage.	Fair: too clayey, wetness.
SlC, SlD---------- Silawa	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
SpB---------- Splendora	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
SrC, SrD---------- Straber	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight----------	Poor: too clayey, hard to pack.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
StC---------- Styx	Moderate: wetness.	Severe: seepage.	Moderate: wetness, too clayey.	Severe: seepage.	Fair: too clayey.
Su---------- Sumpf	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding, too clayey.	Severe: flooding, ponding.	Poor: too clayey, hard to pack, ponding.
TaC---------- Tabor	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight----------	Poor: too clayey, hard to pack.
TeC, TeD---------- Tremona	Severe: wetness, percs slowly, poor filter.	Severe: seepage.	Severe: wetness, too clayey.	Severe: seepage.	Poor: too clayey, hard to pack.
Tr---------- Trinity	Severe: flooding, wetness, percs slowly.	Slight----------	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
Wa---------- Waller	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
WlA---------- Wilson	Severe: wetness, percs slowly.	Slight----------	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
WlB---------- Wilson	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
WoA, WoB---------- Wockley	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage, wetness.	Poor: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
AnA, AnC Annona	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
ArA Aris	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
AxC, AxC2, AxD Axtell	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
BbB Bleiblerville	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Be Bosque	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
BoC Boy	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
BrA, BrB Brazoria	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Bs Brazoria	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
BtD Brenham	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
BuA Burleson	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
CaB, CaC, CaD Carbengle	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, too clayey.
CcD Catilla	Good	Improbable: thin layer.	Improbable: too sandy.	Fair: too sandy.
ChC, ChD Chazos	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Cm Clemville	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
CoC Conroe	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones.
CpC* Conroe	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones.
CrC, CrC2, CrD Crockett	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
CuB, CuC, CuD--------- Cuero	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
DeC--------- Depcor	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones.
DuD--------- Dutek	Good----------	Probable----------	Improbable: too sandy.	Fair: too sandy.
EdA, EdB--------- Edna	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, too clayey.
EuC--------- Eufaula	Slight----------	Probable----------	Improbable: too sandy.	Poor: too sandy.
FeC--------- Fetzer	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, thin layer.
FrB, FrC, FrD--------- Frelsburg	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
HoB, HoC--------- Hockley	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
HpC--------- Hockley	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
HzC*--------- Hockley	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
KaA, KaB--------- Katy	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
KcB*: Katy--------- Edna---------	Poor: low strength, wetness. Poor: low strength, wetness, shrink-swell.	Improbable: excess fines. Improbable: excess fines.	Improbable: excess fines. Improbable: excess fines.	Poor: wetness. Poor: wetness, too clayey.
KeD--------- Kenney	Good----------	Probable----------	Improbable: too sandy.	Fair: too sandy.
KlC, KlD--------- Klump	Good----------	Improbable: excess fines.	Improbable: excess fines.	Good.
KnC--------- Knolle	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
KuC--------- Kuy	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
KyB*: Kuy---------	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
KyB*:				
Aris	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
LaA, LaB, LaD---------- Lake Charles	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
LdC---------- Landman	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
LlE*:				
Landman----------	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
Larue----------	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
LtC, LtE---------- Latium	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
LuA, LuB---------- Lufkin	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
MaA, MaB---------- Mabank	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
MdA, MdB, Mp---------- Midland	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
MvC---------- Monaville	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, thin layer.
Na---------- Nahatche	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
NeC---------- Newulm	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
NoA---------- Norwood	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
NrA---------- Norwood	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
OkA---------- Oklared	Good----------	Improbable: excess fines.	Improbable: excess fines.	Good.
On*:				
Oklared----------	Good----------	Improbable: excess fines.	Improbable: excess fines.	Good.
Norwood----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
RaA, RaB---------- Rader	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
ReF---------- Renish	Poor: low strength, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
SeC---------- Sealy	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
SgC---------- Segno	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
SlC, SlD---------- Silawa	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, area reclaim.
SpB---------- Splendora	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
SrC, SrD---------- Straber	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
StC---------- Styx	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
Su---------- Sumpf	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
TaC---------- Tabor	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
TeC, TeD---------- Tremona	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
Tr---------- Trinity	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Wa---------- Waller	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
WlA, WlB---------- Wilson	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
WoA, WoB---------- Wockley	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
AnA, AnC---------- Annona	Slight---------	Moderate: hard to pack.	Percs slowly	Wetness, percs slowly.	Percs slowly, wetness, erodes easily	Percs slowly, erodes easily
ArA---------- Aris	Slight---------	Severe: wetness.	Percs slowly	Wetness, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
AxC---------- Axtell	Slight---------	Severe: hard to pack.	Not needed----	Percs slowly, erodes easily	Erodes easily, percs slowly.	Erodes easily, percs slowly.
AxC2, AxD--------- Axtell	Slight---------	Severe: hard to pack.	Not needed----	Percs slowly, slope, erodes easily	Erodes easily, percs slowly.	Erodes easily, percs slowly.
BbB---------- Bleiblerville	Slight---------	Severe: hard to pack.	Deep to water	Slow intake, percs slowly.	Percs slowly	Percs slowly.
Be---------- Bosque	Moderate: seepage.	Moderate: piping.	Not needed----	Flooding------	Favorable-----	Favorable.
BoC---------- Boy	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, slope.	Too sandy-----	Droughty.
BrA, BrB---------- Brazoria	Slight---------	Severe: hard to pack, wetness.	Percs slowly	Wetness, slow intake, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
Bs---------- Brazoria	Slight---------	Severe: hard to pack, ponding.	Ponding, percs slowly.	Ponding, slow intake, percs slowly.	Ponding, percs slowly.	Wetness, percs slowly.
BtD---------- Brenham	Moderate: seepage.	Moderate: hard to pack.	Deep to water	Slope---------	Favorable-----	Favorable.
BuA---------- Burleson	Slight---------	Severe: hard to pack.	Not needed----	Slow intake, percs slowly.	Percs slowly	Percs slowly.
CaB---------- Carbengle	Moderate: depth to rock.	Moderate: thin layer, piping.	Deep to water	Depth to rock	Depth to rock	Depth to rock.
CaC, CaD---------- Carbengle	Moderate: depth to rock.	Moderate: thin layer, piping.	Deep to water	Depth to rock, slope.	Depth to rock	Depth to rock.
CcD---------- Catilla	Severe: seepage.	Moderate: piping, seepage.	Deep to water	Fast intake, droughty, soil blowing.	Too sandy-----	Droughty.
ChC---------- Chazos	Moderate: slope.	Moderate: hard to pack.	Not needed----	Fast intake, soil blowing, percs slowly.	Soil blowing, percs slowly.	Percs slowly.
ChD---------- Chazos	Slight---------	Moderate: hard to pack.	Not needed----	Fast intake, soil blowing, percs slowly.	Soil blowing, percs slowly.	Percs slowly.
Cm---------- Clemville	Slight---------	Moderate: hard to pack.	Deep to water	Percs slowly, erodes easily flooding.	Percs slowly--	Percs slowly.
CoC---------- Conroe	Slight---------	Moderate: hard to pack, wetness.	Percs slowly, slope.	Wetness, droughty, fast intake.	Wetness, percs slowly.	Droughty, rooting depth.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
CpC*---------- Conroe	Slight---------	Moderate: hard to pack, wetness.	Percs slowly, slope.	Wetness, droughty, fast intake.	Wetness, percs slowly.	Droughty, rooting depth
CrC---------- Crockett	Slight---------	Moderate: hard to pack.	Not needed----	Percs slowly, erodes easily	Erodes easily, percs slowly.	Erodes easily, percs slowly.
CrC2, CrD--------- Crockett	Slight---------	Moderate: hard to pack.	Not needed----	Percs slowly, slope, erodes easily	Erodes easily, percs slowly.	Erodes easily, percs slowly.
CuB---------- Cuero	Moderate: seepage.	Moderate: piping.	Not needed----	Favorable-----	Favorable-----	Favorable.
CuC, CuD---------- Cuero	Moderate: seepage.	Moderate: piping.	Not needed----	Slope---------	Favorable-----	Favorable.
DeC---------- Depcor	Slight---------	Moderate: thin layer, piping, wetness.	Percs slowly, slope.	Wetness, fast intake.	Wetness, percs slowly.	Percs slowly.
DuD---------- Dutek	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, slope.	Too sandy, soil blowing.	Droughty.
EdA, EdB---------- Edna	Slight---------	Severe: hard to pack, wetness.	Percs slowly	Wetness, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
EuC---------- Eufaula	Severe: seepage.	Severe: seepage.	Deep to water	Fast intake, droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
FeC---------- Fetzer	Slight---------	Moderate: wetness.	Percs slowly, slope.	Fast intake, percs slowly, slope.	Wetness, percs slowly.	Percs slowly.
FrB---------- Frelsburg	Slight---------	Severe: hard to pack.	Deep to water	Slow intake, percs slowly.	Percs slowly	Percs slowly.
FrC, FrD---------- Frelsburg	Slight---------	Severe: hard to pack.	Deep to water	Slow intake, slope, percs slowly.	Percs slowly	Percs slowly.
HoB, HoC---------- Hockley	Moderate: seepage.	Moderate: piping.	Deep to water	Favorable-----	Favorable-----	Favorable.
HpC---------- Hockley	Moderate: seepage.	Moderate: piping.	Deep to water	Droughty------	Favorable-----	Droughty.
HzC*---------- Hockley	Moderate: seepage.	Moderate: piping.	Deep to water	Slope---------	Favorable-----	Favorable.
KaA, KaB---------- Katy	Slight---------	Severe: wetness.	Percs slowly	Wetness, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
KcB*: Katy----------	Moderate: seepage.	Severe: wetness.	Percs slowly	Wetness, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
Edna----------	Slight---------	Severe: hard to pack, wetness.	Percs slowly	Wetness, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
KeD---------- Kenney	Severe: seepage.	Severe: seepage, piping.	Not needed----	Droughty, fast intake, slope.	Too sandy-----	Droughty.
KlC, KlD---------- Klump	Severe: seepage.	Moderate: thin layer, piping.	Deep to water	Slope---------	Too sandy-----	Favorable.
KnC---------- Knolle	Severe: seepage.	Moderate: thin layer, piping.	Deep to water	Fast intake, slope.	Favorable-----	Favorable.
KuC---------- Kuy	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, slope.	Too sandy-----	Droughty.
KyB*: Kuy----------	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake.	Too sandy-----	Droughty.
Aris----------	Slight---------	Severe: wetness.	Percs slowly	Wetness, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
LaA, LaB, LaD----- Lake Charles	Slight---------	Severe: hard to pack, wetness.	Percs slowly	Wetness, slow intake, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
LdC---------- Landman	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, slope.	Too sandy-----	Droughty.
LlE*: Landman----------	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, slope.	Too sandy-----	Droughty.
Larue----------	Severe: seepage.	Severe: thin layer.	Deep to water	Droughty, fast intake, slope.	Too sandy-----	Droughty.
LtC---------- Latium	Slight---------	Severe: hard to pack.	Deep to water	Slow intake, percs slowly, slope.	Percs slowly	Percs slowly.
LtE---------- Latium	Slight---------	Severe: hard to pack.	Deep to water	Slow intake, percs slowly, slope.	Slope, percs slowly.	Percs slowly, slope.
LuA, LuB---------- Lufkin	Slight---------	Severe: hard to pack, wetness.	Percs slowly	Wetness, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
MaA, MaB---------- Mabank	Slight---------	Severe: wetness.	Percs slowly	Wetness, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
MdA, MdB---------- Midland	Slight---------	Severe: wetness.	Percs slowly	Wetness, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
Mp---------- Midland	Slight---------	Severe: ponding.	Ponding, percs slowly.	Ponding, percs slowly.	Ponding, percs slowly.	Wetness, percs slowly.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
MvC---------- Monaville	Moderate: seepage.	Moderate: piping.	Deep to water	Fast intake, droughty, slope.	Too sandy-----	Droughty.
Na---------- Nahatche	Moderate: seepage.	Severe: wetness.	Flooding------	Wetness, flooding.	Wetness-------	Wetness.
NeC---------- Newulm	Severe: seepage.	Moderate: piping.	Deep to water	Droughty, fast intake, slope.	Favorable-----	Droughty.
NoA---------- Norwood	Moderate: seepage.	Severe: piping.	Deep to water	Favorable-----	Favorable-----	Favorable.
NrA---------- Norwood	Moderate: seepage.	Severe: piping.	Deep to water	Favorable-----	Favorable-----	Favorable.
OkA---------- Oklared	Severe: seepage.	Severe: piping.	Deep to water	Favorable-----	Favorable-----	Favorable.
On*:						
Oklared----------	Severe: seepage.	Severe: piping.	Deep to water	Flooding------	Favorable-----	Favorable.
Norwood----------	Moderate: seepage.	Severe: piping.	Deep to water	Favorable-----	Favorable-----	Favorable.
RaA, RaB---------- Rader	Slight---------	Moderate: hard to pack, wetness.	Percs slowly	Wetness, percs slowly.	Wetness, percs slowly.	Percs slowly.
ReF---------- Renish	Severe: depth to rock.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock	Slope, depth to rock
SeC---------- Sealy	Severe: seepage.	Severe: piping.	Cutbanks cave	Wetness, fast intake.	Wetness, too sandy.	Wetness, droughty.
SgC---------- Segno	Severe: seepage.	Moderate: piping, wetness.	Slope---------	Wetness-------	Wetness-------	Rooting depth.
SlC, SlD---------- Silawa	Severe: seepage.	Moderate: piping.	Deep to water	Fast intake, soil blowing, slope.	Soil blowing	Favorable.
SpB---------- Splendora	Slight---------	Severe: wetness.	Percs slowly	Wetness, percs slowly, rooting depth	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, rooting depth.
SrC, SrD---------- Straber	Slight---------	Moderate: hard to pack.	Deep to water	Percs slowly, fast intake.	Percs slowly	Percs slowly.
StC---------- Styx	Severe: seepage.	Moderate: piping.	Deep to water	Droughty, fast intake, slope.	Too sandy-----	Droughty.
Su---------- Sumpf	Slight---------	Severe: ponding, hard to pack.	Percs slowly, flooding.	Ponding, percs slowly.	Ponding, percs slowly.	Wetness, percs slowly.
TaC---------- Tabor	Slight---------	Moderate: hard to pack.	Not needed----	Percs slowly, slope, erodes easily	Erodes easily, percs slowly.	Erodes easily, percs slowly.
TeC, TeD---------- Tremona	Slight---------	Moderate: hard to pack, wetness.	Percs slowly, slope.	Wetness, droughty, fast intake.	Wetness, soil blowing, percs slowly.	Droughty, percs slowly.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Tr---------- Trinity	Slight----------	Severe: hard to pack, wetness.	Percs slowly, flooding.	Wetness, slow intake, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
Wa---------- Waller	Slight----------	Severe: piping, ponding.	Favorable-----	Ponding-------	Ponding-------	Wetness.
WlA, WlB---------- Wilson	Slight----------	Severe: hard to pack, wetness.	Percs slowly	Wetness, percs slowly.	Wetness, percs slowly.	Wetness, erodes easily.
WoA, WoB---------- Wockley	Severe: seepage.	Severe: wetness.	Favorable-----	Wetness-------	Wetness-------	Wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
AnA, AnC--------- Annona	0-8	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-4	0	95-100	95-100	75-95	45-70	<30	NP-7
	8-28	Clay, clay loam	CH	A-7	0	95-100	95-100	90-100	75-95	51-70	30-45
	28-75	Clay, clay loam	CH, CL	A-7	0	95-100	95-100	90-100	75-95	41-65	25-45
ArA-------------- Aris	0-16	Fine sandy loam	ML, CL, SC, SM	A-4	0	98-100	95-100	95-100	40-60	<25	NP-9
	16-28	Sandy clay loam, clay loam, silty clay loam.	CL	A-6, A-7	0	100	95-100	95-100	55-75	39-48	18-25
	28-70	Clay, clay loam, silty clay loam.	CL, CH	A-7	0	100	95-100	95-100	60-80	42-62	21-36
AxC-------------- Axtell	0-8	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-2-4, A-4	0	90-100	80-100	75-100	28-75	<31	NP-7
	8-22	Clay, clay loam, sandy clay.	CL, CH	A-7-6	0-2	90-100	75-100	75-100	51-98	41-65	25-40
	22-48	Clay, clay loam, sandy clay.	CL, CH	A-7-6	0-2	90-100	75-100	75-100	51-98	41-65	25-40
	48-60	Sandy clay loam, clay loam, clay.	CL, CH, SC	A-6, A-7-6	0-2	85-100	75-100	75-100	36-98	35-70	15-45
AxC2------------- Axtell	0-4	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-2-4, A-4	0	90-100	80-100	75-100	28-75	<31	NP-7
	4-26	Clay, clay loam, sandy clay.	CL, CH	A-7-6	0-2	90-100	75-100	75-100	51-98	41-65	25-40
	26-52	Clay, clay loam, sandy clay.	CL, CH	A-7-6	0-2	90-100	75-100	75-100	51-98	41-65	25-40
	52-65	Sandy clay loam, clay loam, clay.	CL, CH, SC	A-6, A-7-6	0-2	85-100	75-100	75-100	36-98	35-70	15-45
AxD-------------- Axtell	0-7	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-2-4, A-4	0	90-100	80-100	75-100	28-75	<31	NP-7
	7-25	Clay, clay loam, sandy clay.	CL, CH	A-7-6	0-2	90-100	75-100	75-100	51-98	41-65	25-40
	25-54	Clay, clay loam, sandy clay.	CL, CH	A-7-6	0-2	90-100	75-100	75-100	51-98	41-65	25-40
	54-65	Sandy clay loam, clay loam, clay.	CL, CH, SC	A-6, A-7-6	0-2	85-100	75-100	75-100	36-98	35-70	15-45
BbB-------------- Bleiblerville	0-70	Clay----------	CH	A-7-6	0	95-100	95-100	90-100	85-100	55-85	35-60
Be--------------- Bosque	0-25	Clay loam--------	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	55-96	24-45	7-25
	25-70	Loam, clay loam	CL, CL-ML	A-6, A-7-6	0	100	95-100	95-100	55-80	26-45	7-25
BoC-------------- Boy	0-45	Loamy fine sand	SM, SM-SC	A-2-4	0	100	100	85-100	14-35	<25	NP-7
	45-72	Sandy loam, fine sandy loam, sandy clay loam.	CL, CL-ML, SC, SM-SC	A-4, A-6	0	100	90-100	80-100	36-55	23-40	6-20
BrA-------------- Brazoria	0-80	Clay----------	CH	A-7	0	98-100	98-100	95-100	95-100	60-80	35-52
BrB, Bs---------- Brazoria	0-60	Clay----------	CH	A-7	0	98-100	98-100	95-100	95-100	60-80	35-52
BtD-------------- Brenham	0-17	Clay loam--------	CL, CH	A-7-6	0	100	100	85-100	70-100	35-49	17-27
	17-60	Silty clay loam, clay loam, clay.	CL, CH	A-7-6, A-6	0	95-100	95-100	85-100	75-100	39-55	20-33

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
BuA---------- Burleson	0-15	Clay----------	CH	A-7-6, A-7-5	0-2	83-100	80-100	80-100	80-96	51-90	27-55
	15-70	Clay, silty clay	CH	A-7-6, A-7-5	0-1	95-100	80-100	75-99	70-95	51-90	30-55
CaB---------- Carbengle	0-12	Clay loam--------	CL	A-6, A-4	0-5	90-100	85-100	70-98	51-80	25-40	8-20
	12-28	Loam, clay loam, silty clay loam.	CL, SC	A-6, A-4	0-8	85-100	85-100	70-98	36-85	25-40	8-20
	28-40	Weathered bedrock	---	---	---	---	---	---	---	---	---
CaC---------- Carbengle	0-10	Clay loam--------	CL	A-6, A-4	0-5	90-100	85-100	70-98	51-80	25-40	8-20
	10-24	Loam, clay loam, silty clay loam.	CL, SC	A-6, A-4	0-8	85-100	85-100	70-98	36-85	25-40	8-20
	24-58	Weathered bedrock	---	---	---	---	---	---	---	---	---
CaD---------- Carbengle	0-8	Clay loam--------	CL	A-6, A-4	0-5	90-100	85-100	70-98	51-80	25-40	8-20
	8-22	Loam, clay loam, silty clay loam.	CL, SC	A-6, A-4	0-8	85-100	85-100	70-98	36-85	25-40	8-20
	22-40	Weathered bedrock	---	---	---	---	---	---	---	---	---
CcD---------- Catilla	0-50	Loamy fine sand	SM, SP-SM	A-2-4, A-3	0	90-100	85-100	80-100	8-28	<25	NP-3
	50-72	Sandy clay loam	SC, CL	A-6, A-4, A-2-6, A-2-4	0	90-100	85-100	80-100	25-55	25-40	8-20
ChC---------- Chazos	0-15	Loamy fine sand	SM, SM-SC	A-2-4, A-4	0	80-100	80-100	60-98	20-50	<25	NP-4
	15-25	Clay, sandy clay	CL, CH	A-7-6	0	90-100	90-100	90-100	55-85	43-58	21-35
	25-55	Clay, sandy clay	CL, CH	A-7-6	0	90-100	90-100	90-100	55-85	43-58	21-35
	55-66	Clay, sandy clay, sandy clay loam.	CL, CH	A-7-6, A-6	0	90-100	90-100	80-100	50-80	35-55	15-35
ChD---------- Chazos	0-15	Loamy fine sand	SM, SM-SC	A-2-4, A-4	0	80-100	80-100	60-98	20-50	<25	NP-4
	15-26	Clay, sandy clay	CL, CH	A-7-6	0	90-100	90-100	90-100	55-85	43-58	21-35
	26-40	Clay, sandy clay	CL, CH	A-7-6	0	90-100	90-100	90-100	55-85	43-58	21-35
	40-60	Clay, sandy clay, sandy clay loam.	CL, CH	A-7-6, A-6	0	90-100	90-100	80-100	50-80	35-55	15-35
Cm---------- Clemville	0-20	Silt loam--------	CL, CL-ML	A-6, A-4	0	98-100	98-100	95-100	70-95	25-45	6-25
	20-25	Silt loam, silty clay loam.	CL	A-6	0	98-100	98-100	95-100	70-95	30-40	10-20
	25-60	Silty clay, clay, silty clay loam.	CL, CH	A-7	0	98-100	98-100	95-100	85-100	41-70	22-50
CoC---------- Conroe	0-22	Loamy fine sand	SM, SM-SC	A-2-4, A-4	0	80-100	80-98	45-80	15-50	<25	NP-4
	22-25	Sandy clay loam, sandy clay, clay loam.	SC, CL	A-2-6, A-2-7, A-6, A-7	0	65-95	65-95	50-90	25-60	30-45	12-25
	25-70	Sandy clay, clay	CL, SC, CH	A-7-6, A-6	0	80-100	75-100	60-95	35-60	40-55	20-35
CpC*---------- Conroe	0-3	Gravelly loamy fine sand.	GM, SM-SC, SM, GP-GM	A-1, A-4, A-2-4	0	35-85	35-80	20-70	8-40	<25	NP-4
	3-65	Sandy clay loam, sandy clay.	CL, SC, CH	A-7-6, A-6	0	80-100	75-100	60-95	35-60	35-55	18-35
CrC---------- Crockett	0-8	Fine sandy loam	SM, ML, CL, SC	A-4, A-6	0-2	95-100	95-100	90-100	35-98	20-35	3-15
	8-19	Clay, clay loam, sandy clay.	CH, CL	A-7, A-6	0	85-100	80-100	75-100	65-98	36-60	22-45
	19-61	Clay, clay loam, sandy clay.	CH, CL	A-7, A-6	0	85-100	80-100	75-100	51-98	36-60	18-45
	61-73	Clay loam, sandy clay loam, loam.	CL, CH	A-6, A-7	0-5	90-100	85-100	75-100	51-90	30-60	15-40

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
CrC2---------- Crockett	0-5	Fine sandy loam	SM, ML, CL, SC	A-4, A-6	0-2	95-100	95-100	90-100	35-98	20-35	3-15
	5-15	Clay, clay loam, sandy clay.	CH, CL	A-7, A-6	0	85-100	80-100	75-100	65-98	36-60	22-45
	15-55	Clay, clay loam, sandy clay.	CH, CL	A-7, A-6	0	85-100	80-100	75-100	51-98	36-60	18-45
	55-70	Clay loam, sandy clay loam, loam.	CL, CH	A-6, A-7	0-5	90-100	85-100	75-100	51-90	30-60	15-35
CrD---------- Crockett	0-8	Fine sandy loam	SM, ML, CL, SC	A-4, A-6	0-2	95-100	95-100	90-100	35-98	20-35	3-15
	8-32	Clay, clay loam, sandy clay.	CH, CL	A-7, A-6	0	85-100	80-100	75-100	65-98	36-60	22-45
	32-50	Clay, clay loam, sandy clay.	CH, CL	A-7, A-6	0	85-100	80-100	75-100	51-98	36-60	18-45
	50-70	Clay loam, sandy clay loam, loam.	CL, CH	A-6, A-7	0-5	90-100	85-100	75-100	51-90	30-60	15-40
CuB---------- Cuero	0-14	Loam----------	CL, SC	A-4, A-6, A-2-4, A-2-6	0	95-100	95-100	70-95	30-70	25-35	8-15
	14-35	Sandy clay loam, clay loam.	CL, SC	A-6, A-7	0	95-100	95-100	80-100	40-80	30-44	11-22
	35-55	Sandy clay loam, clay loam.	CL, SC	A-6	0	85-100	85-100	80-90	36-55	30-40	11-20
	55-65	Variable---------	---	---	---	---	---	---	---	---	---
CuC---------- Cuero	0-23	Loam----------	CL, SC	A-4, A-6, A-2-4, A-2-6	0	95-100	95-100	70-95	30-70	25-35	8-15
	23-45	Sandy clay loam, clay loam.	CL, SC	A-6, A-7	0	95-100	95-100	80-100	40-80	30-44	11-22
	45-60	Sandy clay loam, clay loam.	CL, SC	A-6	0	85-100	85-100	80-90	36-55	30-40	11-20
CuD---------- Cuero	0-18	Loam----------	CL, SC	A-4, A-6, A-2-4, A-2-6	0	95-100	95-100	70-95	30-70	25-35	8-15
	18-50	Sandy clay loam, clay loam.	CL, SC	A-6, A-7	0	95-100	95-100	80-100	40-80	30-44	11-22
	50-72	Sandy clay loam, clay loam.	CL, SC	A-6	0	85-100	85-100	80-90	36-55	30-40	11-20
DeC---------- Depcor	0-22	Loamy fine sand	SM, SM-SC	A-2-4, A-4	0	90-100	90-100	50-100	15-45	<25	NP-4
	22-72	Sandy clay loam, clay loam.	SC, CL	A-4, A-6	0	85-100	75-100	75-100	36-75	25-39	8-25
DuD---------- Dutek	0-25	Loamy fine sand	SM, SP-SM	A-2	0	95-100	95-100	90-100	10-25	<22	NP-3
	25-45	Sandy clay loam, clay loam.	CL, SC, SM-SC, CL-ML	A-2, A-4, A-6	0	98-100	95-100	90-100	30-55	24-40	6-20
	45-72	Fine sandy loam, sandy clay loam, loam.	SC, SM-SC, CL-ML, CL	A-2, A-4, A-6	0	95-100	95-100	90-100	22-55	20-40	4-20
EdA---------- Edna	0-8	Fine sandy loam	CL-ML, SM-SC, CL, SC	A-4, A-6	0	100	100	90-100	45-75	23-40	6-20
	8-39	Clay, clay loam	CH	A-7	0	100	98-100	90-100	60-80	50-72	28-46
	39-65	Clay, clay loam	CL, CH	A-7	0	100	98-100	80-100	70-80	41-60	20-36
EdB---------- Edna	0-8	Fine sandy loam	CL-ML, SM-SC, CL, SC	A-4, A-6	0	100	100	90-100	45-75	23-40	6-20
	8-48	Clay, clay loam	CH	A-7	0	100	98-100	90-100	60-80	50-72	28-46
	48-65	Clay, clay loam	CL, CH	A-7	0	100	98-100	80-100	70-80	41-60	20-36
EuC---------- Eufaula	0-80	Fine sand--------	SM, SP-SM	A-2, A-3	0	100	98-100	82-100	5-35	---	NP

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
FeC---------- Fetzer	0-28	Loamy fine sand	SM, SM-SC	A-2-4, A-4	0	95-100	95-100	50-98	15-45	<25	NP-7
	28-39	Clay loam, sandy clay loam.	SC, CL	A-6, A-7-6	0	95-100	95-100	80-98	36-80	30-45	11-25
	39-74	Clay loam, sandy clay, clay.	CL, CH, SC	A-7-6, A-6	0	95-100	95-100	85-100	50-95	35-55	15-30
FrB, FrC---------- Frelsburg	0-65	Clay----------	CH	A-7-6	0	95-100	95-100	90-100	85-100	55-90	35-65
FrD---------- Frelsburg	0-60	Clay----------	CH	A-7-6	0	95-100	95-100	90-100	85-100	55-90	35-65
HoB---------- Hockley	0-22	Fine sandy loam	ML, CL-ML, SM, SM-SC	A-4, A-2-4	0	85-100	85-100	75-100	30-80	<25	NP-7
	22-32	Sandy clay loam, clay loam, loam.	CL	A-6, A-7, A-4	0	90-100	89-100	75-95	51-80	22-49	8-32
	32-61	Sandy clay loam, clay loam, loam.	CL, SC	A-4, A-6, A-7	0	70-95	60-90	55-90	36-70	22-49	8-32
HoC---------- Hockley	0-23	Fine sandy loam	ML, CL-ML, SM, SM-SC	A-4, A-2-4	0	85-100	85-100	75-100	30-80	<25	NP-7
	23-45	Sandy clay loam, clay loam, loam.	CL	A-6, A-7, A-4	0	90-100	89-100	75-95	51-80	22-49	8-32
	45-62	Sandy clay loam, clay loam, loam.	CL, SC	A-4, A-6, A-7	0	70-95	60-90	55-90	36-70	22-49	8-32
HpC---------- Hockley	0-24	Gravelly fine sandy loam, very gravelly sandy loam.	SM, SM-SC	A-2-4, A-4	0	70-90	50-85	45-85	25-48	<25	NP-7
	24-45	Sandy clay loam, clay loam, loam.	CL	A-6, A-7, A-4	0	90-100	89-100	75-95	51-80	22-49	8-32
	45-72	Sandy clay loam, clay loam, loam.	CL, SC	A-4, A-6, A-7	0	70-95	60-90	55-90	36-70	22-49	8-32
HzC*---------- Hockley	0-6	Gravelly fine sandy loam.	SM, SM-SC	A-2-4, A-4	0	70-90	50-85	45-85	25-48	<25	NP-7
	6-24	Sandy clay loam, clay loam, loam.	CL	A-6, A-7, A-4	0	90-100	89-100	75-95	51-80	22-49	8-32
	24-65	Sandy clay loam, clay loam, loam.	CL, SC	A-4, A-6, A-7	0	70-95	60-90	55-90	36-70	22-49	8-32
KaA---------- Katy	0-22	Fine sandy loam	ML, SM	A-4	0	98-100	98-100	98-100	38-60	<22	NP-3
	22-29	Clay loam, sandy clay loam.	CL	A-6, A-7, A-4	0	98-100	98-100	96-100	55-75	23-48	8-30
	29-80	Clay loam, clay, sandy clay loam.	CL, CH	A-6, A-7	0	100	98-100	98-100	55-77	35-53	18-35
KaB---------- Katy	0-25	Fine sandy loam	ML, SM	A-4	0	98-100	98-100	98-100	38-60	<22	NP-3
	25-45	Clay loam, sandy clay loam.	CL	A-6, A-7, A-4	0	98-100	98-100	96-100	55-75	23-48	8-30
	45-72	Clay loam, clay, sandy clay loam.	CL, CH	A-6, A-7	0	100	98-100	98-100	55-75	35-53	18-35
KcB*:											
Katy----------	0-25	Fine sandy loam	ML, SM	A-4	0	100	98-100	98-100	38-60	<22	NP-3
	25-32	Clay loam, sandy clay loam.	CL	A-6, A-7, A-4	0	100	98-100	96-100	55-77	23-48	8-30
	32-65	Clay loam, clay, sandy clay loam.	CL, CH	A-6, A-7	0	100	100	98-100	55-75	35-53	18-35
Edna----------	0-8	Fine sandy loam	CL-ML, SM-SC, CL, SC	A-4, A-6	0	100	100	90-100	45-75	23-40	6-20
	8-39	Clay, clay loam	CH	A-7	0	100	98-100	90-100	60-80	50-72	28-46
	39-65	Clay, clay loam	CL, CH	A-7	0	100	98-100	80-100	70-80	41-60	20-36
KeD---------- Kenney	0-62	Loamy fine sand	SM, SP-SM	A-2-4	0	100	99-100	75-100	10-30	<22	NP-3
	62-80	Fine sandy loam, sandy clay loam, clay loam.	SC, CL, CL-ML, SM-SC	A-4, A-6, A-2-4, A-2-6	0	100	95-100	80-100	30-55	25-40	7-20

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
KlC----------	0-12	Sandy loam-------	SM, SM-SC	A-2, A-4	0	100	100	60-85	30-50	<30	NP-7
Klump	12-55	Sandy clay loam, clay loam.	SC, CL	A-4, A-6, A-2	0	100	100	80-100	30-65	23-38	7-15
	55-70	Sandy clay loam, fine sandy loam, sandy loam.	SM, SM-SC, SC	A-2	0	100	100	75-100	15-30	20-27	3-9
KlD----------	0-10	Sandy loam-------	SM, SM-SC	A-2, A-4	0	100	100	60-85	30-50	<30	NP-7
Klump	10-25	Sandy clay loam, clay loam.	SC, CL	A-4, A-6, A-2	0	100	100	80-100	30-65	23-38	7-15
	25-65	Sandy clay loam, fine sandy loam, sandy loam.	SM, SM-SC, SC	A-2	0	100	100	75-100	15-30	20-27	3-9
KnC----------	0-8	Loamy sand-------	SM, SP-SM, SM-SC	A-2-4, A-3	0	100	98-100	80-100	5-25	<25	NP-5
Knolle	8-18	Sandy loam, loamy coarse sand, loamy sand.	SM-SC, SM	A-2-4, A-4	0	100	98-100	80-100	25-46	<27	NP-7
	18-54	Sandy clay loam, clay loam.	SC, CL	A-6, A-4, A-7-6	0	100	98-100	85-100	36-65	20-45	7-23
	54-70	Sandy loam, sandy clay loam, loamy sand.	SM, SM-SC, SC	A-2, A-4	0	100	98-100	85-100	30-45	20-27	3-9
KuC----------	0-52	Loamy fine sand	SM, SM-SC	A-2-4	0	100	95-100	70-100	15-35	<25	NP-7
Kuy	52-72	Sandy clay loam, clay loam.	SC, CL	A-4, A-6	0	100	90-100	75-100	36-75	21-40	7-20
KyB*:											
Kuy----------	0-50	Loamy fine sand	SM, SM-SC	A-2-4	0	100	95-100	70-100	15-35	<25	NP-7
	50-70	Sandy clay loam, clay loam.	SC, CL	A-4, A-6	0	100	90-100	75-100	36-75	21-40	7-20
Aris----------	0-22	Fine sandy loam	ML, CL, SC, SM	A-4	0	98-100	95-100	95-100	40-60	<25	NP-9
	22-35	Sandy clay loam, clay loam, silty clay loam.	CL	A-6, A-7	0	100	95-100	95-100	55-75	39-48	18-25
	35-60	Clay, clay loam, silty clay loam.	CL, CH	A-7	0	100	95-100	95-100	60-80	42-62	21-36
LaA----------	0-9	Clay----------	CH	A-7	0	100	99-100	80-100	75-100	64-80	40-55
Lake Charles	9-62	Clay----------	CH	A-7	0	98-100	98-100	80-100	75-100	54-90	37-60
	62-69	Clay----------	CH	A-7	0	94-100	94-100	80-95	75-95	51-90	30-60
LaB----------	0-25	Clay----------	CH	A-7	0	100	99-100	80-100	75-100	64-80	40-55
Lake Charles	25-60	Clay----------	CH	A-7	0	98-100	98-100	80-100	75-100	54-90	37-60
LaD----------	0-12	Clay----------	CH	A-7	0	100	99-100	80-100	75-100	64-80	40-55
Lake Charles	12-40	Clay----------	CH	A-7	0	98-100	98-100	80-100	75-100	54-90	37-60
	40-65	Clay----------	CH	A-7	0	94-100	94-100	80-95	75-95	51-90	30-60
LdC----------	0-65	Loamy fine sand	SM, SM-SC	A-2-4	0	95-100	95-100	85-100	14-35	<25	NP-7
Landman	65-80	Sandy clay loam, fine sandy loam.	CL, SC, CL-ML, SM-SC	A-4, A-6, A-2-6	0	95-100	90-100	78-100	32-55	23-40	6-20
LlE*:											
Landman----------	0-63	Loamy fine sand	SM, SM-SC	A-2-4	0	95-100	95-100	85-100	14-35	<25	NP-7
	63-80	Sandy clay loam, fine sandy loam.	CL, SC, CL-ML, SM-SC	A-4, A-6, A-2-6	0	95-100	90-100	78-100	32-55	23-40	6-20
Larue----------	0-28	Loamy fine sand	SM	A-2-4	0	100	98-100	50-75	15-30	---	NP
	28-72	Sandy clay loam	SC, SM-SC	A-2-4, A-4, A-6	0	100	95-100	80-90	30-45	20-35	5-12

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
LtC, LtE--------- Latium	0-60	Clay----------	CH	A-7-6	0	95-100	90-100	85-100	80-100	55-85	35-60
LuA---------- Lufkin	0-5	Fine sandy loam	SM, CL, ML, SC	A-4	0-5	90-100	80-100	80-100	40-85	<30	NP-10
	5-45	Clay, clay loam, silty clay loam.	CH, CL	A-7-6	0	90-100	90-100	90-100	65-95	45-67	30-45
	45-62	Clay, clay loam, sandy clay loam.	CH, CL, SC	A-7	0	70-100	70-100	55-100	44-90	40-86	25-55
LuB---------- Lufkin	0-9	Fine sandy loam	SM, CL, ML, SC	A-4	0-5	90-100	80-100	80-100	40-85	<30	NP-10
	9-52	Clay, clay loam, silty clay loam.	CH, CL	A-7-6	0	90-100	90-100	90-100	65-95	45-67	30-45
	52-65	Clay, clay loam, sandy clay loam.	CH, CL, SC	A-7	0	70-100	70-100	55-100	44-90	40-86	25-55
MaA---------- Mabank	0-8	Fine sandy loam	CL, CL-ML, SM-SC, SC	A-4	0	95-100	95-100	80-98	40-70	19-32	4-15
	8-73	Clay, clay loam	CH, CL	A-7, A-6	0	95-100	95-100	95-100	60-85	38-55	22-37
MaB---------- Mabank	0-8	Fine sandy loam	CL, CL-ML, SM-SC, SC	A-4	0	95-100	95-100	80-98	40-70	19-32	4-15
	8-65	Clay, clay loam	CH, CL	A-7, A-6	0	95-100	95-100	95-100	60-85	38-55	22-37
MdA---------- Midland	0-6	Clay loam	CL	A-6, A-7-6	0	100	100	100	95-100	30-42	12-22
	6-72	Silty clay, clay, silty clay loam.	CH, CL	A-7-6	0	100	100	100	95-100	41-65	20-40
MdB---------- Midland	0-8	Clay loam---------	CL	A-6, A-7-6	0	100	100	100	95-100	30-42	12-22
	8-70	Silty clay, clay, silty clay loam.	CH, CL	A-7-6	0	100	100	100	95-100	41-65	20-40
Mp---------- Midland	0-8	Clay loam---------	CL	A-6, A-7-6	0	100	98-100	95-100	95-100	30-42	12-22
	8-62	Silty clay, clay, silty clay loam.	CH, CL	A-7-6	0	100	98-100	95-100	95-100	41-65	20-40
MvC---------- Monaville	0-28	Loamy fine sand	SM	A-2-4, A-4	0	90-100	90-100	50-98	15-45	<25	NP-3
	28-41	Sandy clay loam, loam.	SC, CL	A-6, A-4	0	90-100	90-100	75-98	36-80	20-40	8-18
	41-74	Sandy clay loam, clay loam, loam.	SC, CL	A-6, A-4	0	85-100	90-100	75-98	36-80	20-40	8-25
Na---------- Nahatche	0-8	Loam----------	CL	A-6, A-7, A-4	0	100	100	90-100	51-80	25-45	8-25
	8-62	Loam, clay loam, silty clay loam.	CL	A-6, A-4	0	100	100	85-100	60-75	25-40	8-20
NeC---------- Newulm	0-22	Loamy fine sand	SM, SP-SM	A-2-4	0	95-100	90-100	50-95	5-35	<25	NP-3
	22-31	Sandy clay loam, clay loam.	SC, CL	A-6, A-4, A-2-6, A-2-4	0	95-100	90-100	75-95	25-55	25-40	8-22
	31-80	Sandy clay loam, sandy loam.	SC, CL	A-6, A-4, A-2-6, A-2-4	0	95-100	90-100	70-95	20-55	25-40	8-22
NoA---------- Norwood	0-10	Silt loam---------	CL, CL-ML	A-4, A-6	0	100	100	95-100	51-90	20-35	4-15
	10-63	Silt loam, very fine sandy loam, silty clay loam.	CL, ML, CL-ML	A-4, A-6, A-7	0	100	100	90-100	70-98	20-45	2-25
NrA---------- Norwood	0-16	Silty clay loam	CL, CH	A-6, A-7	0	100	100	95-100	85-98	30-55	15-35
	16-72	Silt loam, very fine sandy loam, silty clay loam.	CL, ML, CL-ML	A-4, A-6, A-7	0	100	100	90-100	70-98	20-45	2-25

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
OkA---------- Oklared	0-8	Very fine sandy loam.	CL, ML, CL-ML	A-4	0	100	100	94-100	51-85	<30	NP-10
	8-70	Fine sandy loam, very fine sandy loam, loam.	SM, SC, ML, CL	A-4	0	100	98-100	94-100	36-85	<30	NP-10
On*:											
Oklared---------	0-60	Very fine sandy loam.	CL, ML, CL-ML	A-4	0	100	100	94-100	51-85	<30	NP-10
Norwood---------	0-8	Loam----------	CL, CL-ML	A-4, A-6	0	100	100	95-100	51-90	20-35	4-15
	8-60	Silt loam, very fine sandy loam, silty clay loam.	CL, ML, CL-ML	A-4, A-6, A-7	0	100	100	90-100	70-98	20-45	2-25
RaA---------- Rader	0-15	Fine sandy loam	ML, CL-ML, SC, SM-SC	A-2, A-4	0	90-100	90-100	70-100	28-70	18-28	3-10
	15-23	Sandy clay loam, loam, clay loam.	SC, CL	A-6	0	90-100	90-100	80-100	36-75	26-40	11-22
	23-65	Sandy clay, clay, clay loam.	CL, CH	A-6, A-7	0	90-100	90-100	85-100	51-90	36-60	18-38
RaB---------- Rader	0-22	Fine sandy loam	ML, CL-ML, SC, SM-SC	A-2, A-4	0	90-100	90-100	70-100	28-70	18-28	3-10
	22-28	Sandy clay loam, loam, clay loam.	SC, CL	A-6	0	90-100	90-100	80-100	36-75	26-40	11-22
	28-52	Sandy clay, clay, clay loam.	CL, CH	A-6, A-7	0	90-100	90-100	85-100	51-90	36-60	18-38
	52-78	Sandy clay loam, sandy clay, clay.	SC, CL	A-6, A-7	0	90-100	90-100	75-100	36-75	30-52	11-30
ReF---------- Renish	0-15	Clay loam--------	CL	A-6, A-4	0-10	85-100	80-100	80-100	65-90	30-40	9-18
	15-16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
SeC---------- Sealy	0-48	Loamy fine sand	SM	A-2-4, A-4	0	90-100	90-100	50-95	15-45	<25	NP-3
	48-72	Sandy clay loam, clay loam, loam.	SC, CL	A-4, A-6, A-2-4, A-2-6	0	90-100	90-100	50-95	26-80	20-40	8-25
SgC---------- Segno	0-15	Fine sandy loam	ML, CL-ML, SM, SM-SC	A-4	0	90-100	90-100	85-100	36-55	<25	NP-7
	15-36	Sandy clay loam, clay loam, fine sandy loam.	CL, SC	A-6, A-4	0	80-100	80-100	70-100	40-60	20-35	8-20
	36-72	Sandy clay loam, clay loam.	CL, SC	A-6, A-7, A-4	0	80-100	80-100	70-100	40-60	22-49	8-32
SlC---------- Silawa	0-10	Loamy fine sand	SM, SM-SC	A-2-4	0	95-100	95-100	70-100	15-35	<25	NP-4
	10-48	Sandy clay loam, fine sandy loam.	CL, SC	A-4, A-6	0	85-100	85-100	80-100	35-60	25-40	8-18
	48-65	Fine sandy loam, gravelly fine sandy loam, sandy clay loam.	CL, CL-ML, SC, SM-SC	A-4, A-6, A-2-4, A-2-6	0-2	70-100	70-100	38-100	18-60	21-34	4-14

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
SlD---------- Silawa	0-12	Loamy fine sand	SM, SM-SC	A-2-4	0	95-100	95-100	70-100	15-35	<25	NP-4
	12-55	Sandy clay loam, fine sandy loam.	CL, SC	A-4, A-6	0	85-100	85-100	80-100	35-60	25-40	8-18
	55-80	Fine sandy loam, gravelly fine sandy loam, sandy clay loam.	CL, CL-ML, SC, SM-SC	A-4, A-6, A-2-4, A-2-6	0-2	70-100	70-100	38-100	18-60	21-34	4-14
SpB---------- Splendora	0-13	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4	0	95-100	95-100	95-100	40-60	<20	NP-7
	13-36	Loam, fine sandy loam, sandy clay loam.	CL, CL-ML	A-4, A-6	0	95-100	85-100	80-100	51-80	20-30	7-16
	36-60	Sandy clay loam, loam, fine sandy loam.	CL, CL-ML	A-4, A-6	0	80-100	80-100	70-100	51-80	20-30	7-16
SrC---------- Straber	0-16	Loamy fine sand	SM, SM-SC	A-2	0-2	85-100	80-100	50-75	15-35	<25	NP-6
	16-32	Clay, sandy clay	CL, CH, SC	A-7	0-2	85-100	80-100	70-100	45-65	45-60	25-40
	32-65	Clay, sandy clay, clay loam.	CL, CH, SC	A-7	0-2	85-100	80-100	70-100	45-85	45-60	25-40
	65-75	Clay loam, sandy clay loam, sandy clay.	CL, CH, SC	A-6, A-7	0	90-100	85-100	75-100	40-70	35-55	15-35
SrD---------- Straber	0-15	Loamy fine sand	SM, SM-SC	A-2	0-2	85-100	80-100	50-75	15-35	<25	NP-6
	15-25	Clay, sandy clay	CL, CH, SC	A-7	0-2	85-100	80-100	70-100	45-65	45-60	25-40
	25-40	Clay, sandy clay, clay loam.	CL, CH, SC	A-7	0-2	85-100	80-100	70-100	45-85	45-60	25-40
	40-72	Clay loam, sandy clay loam, sandy clay.	CL, CH, SC	A-6, A-7	0	90-100	85-100	75-100	40-70	35-55	15-35
StC---------- Styx	0-22	Loamy fine sand	SM, SM-SC	A-2-4, A-4	0	100	100	70-100	15-40	<25	NP-4
	22-80	Sandy clay loam, clay loam.	SC, CL	A-6, A-4	0	100	100	80-100	36-70	20-40	8-20
Su---------- Sumpf	0-60	Clay----------	CH	A-7	0	98-100	98-100	95-100	95-100	55-80	35-55
TaC---------- Tabor	0-15	Fine sandy loam	ML, SM, CL-ML, SM-SC	A-4, A-2-4	0	85-100	75-100	70-100	30-55	<25	NP-7
	15-62	Clay----------	CH, CL	A-7	0	95-100	90-100	85-100	55-90	45-65	25-40
	62-69	Clay, clay loam, sandy clay loam.	CH, CL, SC	A-7, A-6	0	95-100	90-100	75-100	40-90	35-60	15-35
TeC---------- Tremona	0-26	Loamy fine sand	SM, SP-SM	A-2-4, A-3	0	80-100	80-100	60-100	8-35	<25	NP-3
	26-48	Sandy clay, clay	SC, CL, CH	A-7	0	80-100	80-100	75-100	36-85	40-60	20-40
	48-70	Sandy clay loam, sandy clay.	SC, CL, CH	A-7, A-6, A-2-7, A-2-6	0	80-100	80-100	70-100	30-85	30-60	15-40
TeD---------- Tremona	0-21	Loamy fine sand	SM, SP-SM	A-2-4, A-3	0	80-100	80-100	60-100	8-35	<25	NP-3
	21-74	Sandy clay, clay	SC, CL, CH	A-7	0	80-100	80-100	75-100	36-85	40-60	20-40
Tr---------- Trinity	0-65	Clay----------	CH	A-7	0	100	98-100	85-100	80-100	55-90	30-60

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Wa	0-6	Loam	ML, CL-ML	A-4	0	100	98-100	95-100	51-75	<25	NP-6
Waller	6-22	Loam, silt loam, very fine sandy loam.	CL, CL-ML, ML	A-4, A-6	0	100	98-100	95-100	60-90	16-30	2-11
	22-65	Loam, sandy clay loam, clay loam.	CL, CL-ML	A-4, A-6	0	100	98-100	95-100	60-90	20-40	4-20
WlA	0-7	Clay loam	CL	A-6	0	95-100	85-100	80-100	60-96	38-49	20-39
Wilson	7-64	Silty clay, clay, clay loam.	CL, CH	A-7-6, A-6	0	90-100	80-100	80-100	65-96	43-56	26-37
WlB	0-8	Clay loam	CL	A-6	0	95-100	85-100	80-100	60-96	38-49	20-39
Wilson	8-61	Silty clay, clay, clay loam.	CL, CH	A-7-6, A-6	0	90-100	80-100	80-100	65-96	43-56	26-37
WoA	0-23	Fine sandy loam	CL, CL-ML, SM-SC, SM	A-4, A-6	0	95-100	95-100	95-100	45-65	16-33	2-16
Wockley	23-80	Sandy clay loam, clay loam, loam.	CL, SC	A-4, A-6	0	85-100	85-100	80-100	45-80	20-49	8-32
WoB	0-22	Fine sandy loam	CL, CL-ML, SM-SC, SM	A-4, A-6	0	95-100	95-100	95-100	45-65	16-33	2-16
Wockley	22-72	Sandy clay loam, clay loam, loam.	CL, SC	A-4, A-6	0	85-100	85-100	80-100	45-80	20-49	8-32

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
							K	T	
	In	Pct	In/hr	In/in	pH				Pct
AnA, AnC----------	0-8	5-18	0.6-2.0	0.13-0.18	4.5-6.5	Low----------	0.43	5	<1
Annona	8-28	40-60	<0.06	0.12-0.18	4.5-6.0	High----------	0.32		
	28-75	35-60	<0.06	0.12-0.18	5.6-8.4	High----------	0.28		
ArA----------	0-16	10-25	0.6-2.0	0.11-0.15	5.6-7.3	Low----------	0.37	5	<2
Aris	16-28	25-35	0.2-0.6	0.12-0.17	5.1-6.5	Moderate-------	0.32		
	28-70	35-50	<0.06	0.12-0.18	5.1-7.3	High----------	0.32		
AxC----------	0-8	7-18	0.6-2.0	0.11-0.15	5.1-6.5	Low----------	0.43	5	.5-1
Axtell	8-22	40-55	<0.06	0.07-0.12	4.5-5.5	High----------	0.37		
	22-48	40-55	<0.06	0.07-0.12	5.1-7.3	High----------	0.37		
	48-60	25-50	0.2-0.6	0.07-0.12	5.6-8.4	High----------	0.37		
AxC2----------	0-4	7-18	0.6-2.0	0.11-0.15	5.1-6.5	Low----------	0.43	5	.5-1
Axtell	4-26	40-55	<0.06	0.07-0.12	4.5-5.5	High----------	0.37		
	26-52	40-55	<0.06	0.07-0.12	5.1-7.3	High----------	0.37		
	52-65	25-50	0.2-0.6	0.07-0.12	5.6-8.4	High----------	0.37		
AxD----------	0-7	7-18	0.6-2.0	0.11-0.15	5.1-6.5	Low----------	0.43	5	.5-1
Axtell	7-25	40-55	<0.06	0.07-0.12	4.5-5.5	High----------	0.37		
	25-54	40-55	<0.06	0.07-0.12	5.1-7.3	High----------	0.37		
	54-65	25-50	0.2-0.6	0.07-0.12	5.6-8.4	High----------	0.37		
BbB----------	0-70	45-60	<0.06	0.15-0.18	7.4-8.4	Very high------	0.32	5	1-4
Bleiblerville									
Be----------	0-25	20-35	0.6-2.0	0.15-0.20	7.4-8.4	Low----------	0.28	5	1-4
Bosque	25-70	20-35	0.6-2.0	0.15-0.20	7.4-8.4	Low----------	0.28		
BoC----------	0-45	2-10	6.0-20	0.05-0.10	4.5-6.5	Low----------	0.17	5	<2
Boy	45-72	20-35	0.2-0.6	0.10-0.15	4.5-6.0	Low----------	0.24		
BrA----------	0-80	60-80	<0.06	0.14-0.19	7.4-8.4	High----------	0.32	5	2-6
Brazoria									
BrB, Bs----------	0-60	60-80	<0.06	0.14-0.19	7.4-8.4	High----------	0.32	5	2-6
Brazoria									
BtD----------	0-17	25-35	0.6-2.0	0.15-0.20	7.9-8.4	Moderate-------	0.32	5	1-3
Brenham	17-60	36-44	0.6-2.0	0.15-0.20	7.9-8.4	Moderate-------	0.32		
BuA----------	0-15	35-60	<0.06	0.12-0.18	5.6-8.4	High----------	0.32	5	1-3
Burleson	15-70	35-60	<0.06	0.12-0.18	7.4-8.4	High----------	0.32		
CaB----------	0-12	25-35	0.6-2.0	0.15-0.20	7.9-8.4	Low----------	0.32	3	1-3
Carbengle	12-28	25-35	0.6-2.0	0.15-0.20	7.9-8.4	Low----------	0.32		
	28-40	---	---	---	---	----------	----		
CaC----------	0-10	25-35	0.6-2.0	0.15-0.20	7.9-8.4	Low----------	0.32	3	1-3
Carbengle	10-24	25-35	0.6-2.0	0.15-0.20	7.9-8.4	Low----------	0.32		
	24-58	---	---	---	---	----------	----		
CaD----------	0-8	25-35	0.6-2.0	0.15-0.20	7.9-8.4	Low----------	0.32	3	1-3
Carbengle	8-22	25-35	0.6-2.0	0.15-0.20	7.9-8.4	Low----------	0.32		
	22-40	---	---	---	---	----------	----		
CcD----------	0-50	3-12	6.0-20	0.05-0.08	5.6-6.5	Very low-------	0.17	5	<1
Catilla	50-72	20-35	0.2-0.6	0.12-0.16	4.5-6.0	Low----------	0.24		
ChC----------	0-15	5-12	2.0-6.0	0.06-0.10	5.6-7.3	Very low-------	0.20	5	<1
Chazos	15-25	35-50	0.06-0.2	0.15-0.18	5.6-6.5	Moderate-------	0.32		
	25-55	35-50	0.06-0.2	0.15-0.18	5.6-7.3	Moderate-------	0.32		
	55-66	25-45	0.06-0.2	0.15-0.18	5.6-8.4	Moderate-------	0.28		

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
							K	T	
	In	Pct	In/hr	In/in	pH				Pct
ChD----------	0-15	5-12	2.0-6.0	0.06-0.10	5.6-7.3	Very low-------	0.20	5	<1
Chazos	15-26	35-50	0.06-0.2	0.15-0.18	5.6-6.5	Moderate-------	0.32		
	26-40	35-50	0.06-0.2	0.15-0.18	5.6-7.3	Moderate-------	0.32		
	40-60	25-45	0.06-0.2	0.15-0.18	5.6-8.4	Moderate-------	0.28		
Cm----------	0-20	15-25	0.2-0.6	0.17-0.22	7.9-8.4	Low------------	0.43	5	<1
Clemville	20-25	20-30	0.2-0.6	0.17-0.22	7.9-8.4	Low------------	0.43		
	25-60	35-50	0.06-0.2	0.14-0.20	6.6-8.4	High-----------	0.37		
CoC----------	0-22	2-10	2.0-6.0	0.07-0.11	4.5-6.5	Very low-------	0.24	5	<2
Conroe	22-25	30-45	0.06-0.2	0.10-0.20	4.5-5.5	Low------------	0.20		
	25-70	35-50	0.06-0.2	0.10-0.16	4.5-5.5	Low------------	0.17		
CpC*----------	0-3	2-10	2.0-6.0	0.04-0.10	4.5-6.5	Very low-------	0.15	5	<1
Conroe	3-65	30-45	0.06-0.2	0.10-0.16	4.5-5.5	Low------------	0.17		
CrC----------	0-8	5-20	0.6-2.0	0.11-0.20	5.6-7.3	Low------------	0.43	5	.5-2
Crockett	8-19	40-60	<0.06	0.14-0.18	5.6-7.3	High-----------	0.32		
	19-61	40-60	<0.06	0.15-0.18	6.1-8.4	High-----------	0.32		
	61-73	15-45	0.06-0.2	0.12-0.20	7.4-8.4	Moderate-------	0.32		
CrC2----------	0-5	5-20	0.6-2.0	0.11-0.20	5.6-7.3	Low------------	0.43	5	.5-2
Crockett	5-15	40-60	<0.06	0.14-0.18	5.6-7.3	High-----------	0.32		
	15-55	40-60	<0.06	0.15-0.18	6.1-8.4	High-----------	0.32		
	55-70	15-45	0.06-0.2	0.12-0.20	7.4-8.4	Moderate-------	0.32		
CrD----------	0-8	5-20	0.6-2.0	0.11-0.20	5.6-7.3	Low------------	0.43	5	.5-2
Crockett	8-32	40-60	<0.06	0.14-0.18	5.6-7.3	High-----------	0.32		
	32-50	40-60	<0.06	0.15-0.18	6.1-8.4	High-----------	0.32		
	50-70	15-45	0.06-0.2	0.12-0.20	7.4-8.4	Moderate-------	0.32		
CuB----------	0-14	15-30	0.6-2.0	0.11-0.19	6.1-7.8	Low------------	0.24	4	1-3
Cuero	14-35	20-35	0.6-2.0	0.15-0.22	6.6-8.4	Moderate-------	0.28		
	35-55	20-35	0.6-2.0	0.15-0.19	7.9-8.4	Moderate-------	0.32		
	55-65	---	---	---	---	----------	----		
CuC----------	0-23	15-30	0.6-2.0	0.11-0.19	6.1-7.8	Low------------	0.24	4	1-3
Cuero	23-45	20-35	0.6-2.0	0.15-0.22	6.6-8.4	Moderate-------	0.28		
	45-60	20-35	0.6-2.0	0.15-0.19	7.9-8.4	Moderate-------	0.32		
CuD----------	0-18	15-30	0.6-2.0	0.11-0.19	6.1-7.8	Low------------	0.24	4	1-3
Cuero	18-50	20-35	0.6-2.0	0.15-0.22	6.6-8.4	Moderate-------	0.28		
	50-72	20-35	0.6-2.0	0.15-0.19	7.9-8.4	Moderate-------	0.32		
DeC----------	0-22	3-12	6.0-20	0.06-0.11	4.5-6.5	Very low-------	0.17	5	<1
Depcor	22-72	22-35	0.06-0.2	0.10-0.15	4.5-6.5	Low------------	0.24		
DuD----------	0-25	3-12	6.0-20	0.05-0.10	5.6-7.3	Very low-------	0.20	5	<1
Dutek	25-45	18-35	0.6-2.0	0.12-0.17	5.1-6.5	Low------------	0.24		
	45-72	10-30	0.6-6.0	0.10-0.16	4.5-6.5	Low------------	0.24		
EdA----------	0-8	12-25	0.6-2.0	0.10-0.15	5.1-7.3	Low------------	0.43	5	.5-3
Edna	8-39	35-55	<0.06	0.15-0.20	5.6-7.3	High-----------	0.37		
	39-65	35-55	<0.06	0.15-0.20	6.6-8.4	High-----------	0.37		
EdB----------	0-8	12-25	0.6-2.0	0.10-0.15	5.1-7.3	Low------------	0.43	5	.5-3
Edna	8-48	35-55	<0.06	0.15-0.20	5.6-7.3	High-----------	0.37		
	48-65	35-55	<0.06	0.15-0.20	6.6-8.4	High-----------	0.37		
EuC----------	0-80	2-10	6.0-20	0.05-0.11	5.1-7.3	Low------------	0.17	5	.5-1
Eufaula									
FeC----------	0-28	3-12	6.0-20	0.06-0.11	4.5-6.5	Low------------	0.24	5	<1
Fetzer	28-39	25-35	0.06-0.2	0.12-0.18	4.5-6.0	Low------------	0.28		
	39-74	30-50	0.06-0.2	0.12-0.18	4.5-7.8	Moderate-------	0.37		
FrB, FrC----------	0-65	45-60	<0.06	0.15-0.20	7.4-8.4	Very high------	0.32	5	1-4
Frelsburg									

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
							K	T	
	In	Pct	In/hr	In/in	pH				Pct
FrD----------	0-60	45-60	<0.06	0.15-0.20	7.4-8.4	Very high------	0.32	5	1-4
Frelsburg									
HoB----------	0-22	8-20	2.0-6.0	0.10-0.15	5.1-6.5	Low----------	0.24	5	<2
Hockley	22-32	18-35	0.6-2.0	0.12-0.17	5.1-6.5	Moderate-------	0.32		
	32-61	18-35	0.2-0.6	0.10-0.15	5.1-6.5	Moderate-------	0.28		
HoC----------	0-23	8-20	2.0-6.0	0.10-0.15	5.1-6.5	Low----------	0.24	5	<2
Hockley	23-45	18-35	0.6-2.0	0.12-0.17	5.1-6.5	Moderate-------	0.32		
	45-62	18-35	0.2-0.6	0.10-0.15	5.1-6.5	Moderate-------	0.28		
HpC----------	0-24	8-20	2.0-6.0	0.07-0.12	5.1-6.5	Low----------	0.20	5	<2
Hockley	24-45	18-35	0.6-2.0	0.12-0.17	5.1-6.5	Moderate-------	0.32		
	45-72	18-35	0.2-0.6	0.10-0.15	5.1-6.5	Moderate-------	0.28		
HzC*---------	0-6	8-20	2.0-6.0	0.07-0.12	5.1-6.5	Low----------	0.24	5	<1
Hockley	6-24	18-35	0.6-2.0	0.12-0.17	5.1-6.5	Moderate-------	0.32		
	24-65	18-35	0.2-0.6	0.10-0.15	5.1-6.5	Moderate-------	0.28		
KaA----------	0-22	5-15	0.6-2.0	0.15-0.20	5.6-6.5	Low----------	0.37	5	<2
Katy	22-29	25-35	0.06-0.2	0.12-0.18	5.1-7.3	Moderate-------	0.32		
	29-80	35-50	0.2-0.6	0.12-0.18	5.1-7.8	Moderate-------	0.32		
KaB----------	0-25	5-15	0.6-2.0	0.15-0.20	5.6-6.5	Low----------	0.37	5	<2
Katy	25-45	25-35	0.06-0.2	0.12-0.18	5.1-7.3	Moderate-------	0.32		
	45-72	35-50	0.2-0.6	0.12-0.18	5.1-7.8	Moderate-------	0.32		
KcB*:									
Katy----------	0-25	5-15	0.6-2.0	0.15-0.20	5.6-6.5	Low----------	0.37	5	<2
	25-32	25-35	0.06-0.2	0.12-0.18	5.1-7.3	Moderate-------	0.32		
	32-65	35-50	0.2-0.6	0.12-0.18	5.1-7.8	Moderate-------	0.32		
Edna----------	0-8	12-25	0.6-2.0	0.10-0.15	5.1-7.3	Low----------	0.43	5	.5-3
	8-39	35-55	<0.06	0.15-0.20	5.6-7.3	High----------	0.37		
	39-65	35-55	<0.06	0.15-0.20	6.6-8.4	High----------	0.37		
KeD----------	0-62	2-12	6.0-20	0.06-0.10	5.1-6.5	Low----------	0.17	5	<1
Kenney	62-80	15-35	2.0-6.0	0.11-0.15	5.1-6.5	Low----------	0.24		
KlC----------	0-12	5-15	2.0-6.0	0.10-0.14	5.6-7.8	Low----------	0.24	5	1-2
Klump	12-55	20-35	0.6-2.0	0.12-0.17	5.1-7.3	Low----------	0.32		
	55-70	10-25	2.0-6.0	0.10-0.15	5.6-8.4	Low----------	0.32		
KlD----------	0-10	5-15	2.0-6.0	0.10-0.14	5.6-7.8	Low----------	0.24	5	1-2
Klump	10-25	20-35	0.6-2.0	0.12-0.17	5.1-7.3	Low----------	0.32		
	25-65	10-25	2.0-6.0	0.10-0.15	5.6-8.4	Low----------	0.32		
KnC----------	0-8	3-15	6.0-20.0	0.05-0.10	5.6-7.3	Low----------	0.20	5	.5-1
Knolle	8-18	10-25	2.0-6.0	0.10-0.14	5.1-7.3	Low----------	0.24		
	18-54	20-35	0.6-2.0	0.12-0.17	5.1-7.3	Low----------	0.32		
	54-70	10-25	2.0-6.0	0.07-0.14	5.1-6.5	Low----------	0.32		
KuC----------	0-52	5-12	6.0-20	0.07-0.11	6.1-7.3	Low----------	0.17	5	<1
Kuy	52-72	20-35	0.6-20	0.12-0.17	5.1-6.5	Low----------	0.24		
KyB*:									
Kuy----------	0-50	5-12	6.0-20	0.07-0.11	6.1-7.3	Low----------	0.17	5	<1
	50-70	20-35	0.6-20	0.12-0.17	5.1-6.5	Low----------	0.24		
Aris----------	0-22	10-25	0.6-2.0	0.11-0.15	5.6-7.3	Low----------	0.37	5	<2
	22-35	25-35	0.2-0.6	0.12-0.17	5.1-6.5	Moderate-------	0.32		
	35-60	35-50	<0.06	0.12-0.18	5.1-7.3	High----------	0.32		
LaA----------	0-9	40-60	0.06-0.2	0.15-0.20	5.6-7.8	High----------	0.32	5	2-6
Lake Charles	9-62	40-60	<0.06	0.15-0.20	6.6-8.4	High----------	0.32		
	62-69	40-60	<0.06	0.15-0.20	6.6-8.4	High----------	0.32		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
							K	T	
	In	Pct	In/hr	In/in	pH				Pct
LaB----------	0-25	40-60	0.06-0.2	0.15-0.20	5.6-7.8	High----------	0.32	5	2-6
Lake Charles	25-60	40-60	<0.06	0.15-0.20	6.6-8.4	High----------	0.32		
LaD----------	0-12	40-60	0.06-0.2	0.15-0.20	5.6-7.8	High----------	0.32	5	2-6
Lake Charles	12-40	40-60	<0.06	0.15-0.20	6.6-8.4	High----------	0.32		
	40-65	40-60	<0.06	0.15-0.20	6.6-8.4	High----------	0.32		
LdC----------	0-65	2-8	6.0-20	0.05-0.10	5.1-6.5	Very low-------	0.17	5	<2
Landman	65-80	18-35	0.2-0.6	0.10-0.15	4.5-6.5	Low----------	0.24		
LlE*:									
Landman---------	0-63	2-8	6.0-20	0.05-0.10	5.1-6.5	Very low-------	0.17	5	<2
	63-80	18-35	0.2-0.6	0.10-0.15	4.5-6.5	Low----------	0.24		
Larue----------	0-28	3-15	6.0-20	0.05-0.10	5.1-6.5	Low----------	0.17	5	.5-2
	28-72	20-30	0.6-2.0	0.10-0.15	5.1-6.5	Low----------	0.24		
LtC, LtE---------	0-60	45-60	<0.06	0.15-0.18	7.4-8.4	Very high------	0.32	4	.5-2
Latium									
LuA----------	0-5	15-25	0.6-2.0	0.11-0.18	5.1-6.5	Low----------	0.43	5	.5-2
Lufkin	5-45	35-50	<0.06	0.12-0.18	4.5-7.8	Very high------	0.32		
	45-62	35-50	<0.06	0.10-0.14	6.1-8.4	High----------	0.37		
LuB----------	0-9	15-25	0.6-2.0	0.11-0.18	5.1-6.5	Low----------	0.43	5	.5-2
Lufkin	9-52	35-50	<0.06	0.12-0.18	4.5-7.8	Very high------	0.32		
	52-65	35-50	<0.06	0.10-0.14	6.1-8.4	High----------	0.37		
MaA----------	0-8	10-25	0.6-2.0	0.11-0.15	5.6-7.3	Low----------	0.43	5	1-2
Mabank	8-73	35-50	<0.06	0.12-0.18	5.6-8.4	High----------	0.32		
MaB----------	0-8	10-25	0.6-2.0	0.11-0.15	5.6-7.3	Low----------	0.43	5	1-2
Mabank	8-65	35-50	<0.06	0.12-0.18	5.6-8.4	High----------	0.32		
MdA----------	0-6	27-39	0.06-0.2	0.20-0.22	5.1-6.5	Moderate-------	0.37	5	1-4
Midland	6-72	35-55	<0.06	0.18-0.20	5.6-8.4	High----------	0.32		
MdB----------	0-8	27-39	0.06-0.2	0.20-0.22	5.1-6.5	Moderate-------	0.37	5	1-4
Midland	8-70	35-55	<0.06	0.18-0.20	5.6-8.4	High----------	0.32		
Mp----------	0-8	27-39	0.06-0.2	0.20-0.22	5.1-6.5	Moderate-------	0.37	4	1-4
Midland	8-62	35-55	<0.06	0.18-0.20	5.6-8.4	High----------	0.32		
MvC----------	0-28	3-12	6.0-20	0.07-0.11	4.5-6.5	Low----------	0.20	5	<1
Monaville	28-41	18-35	0.6-2.0	0.12-0.17	4.5-6.0	Low----------	0.28		
	41-74	20-35	0.2-0.6	0.10-0.15	4.5-6.0	Moderate-------	0.37		
Na----------	0-8	18-35	0.6-2.0	0.10-0.15	5.1-7.8	Moderate-------	0.28	5	1-3
Nahatche	8-62	18-35	0.6-2.0	0.10-0.15	5.1-7.8	Moderate-------	0.28		
NeC----------	0-22	3-12	6.0-20	0.05-0.08	4.5-6.5	Low----------	0.20	5	<1
Newulm	22-31	20-35	0.2-0.6	0.12-0.17	4.5-6.0	Low----------	0.32		
	31-80	20-35	0.2-0.6	0.10-0.16	4.5-6.0	Low----------	0.32		
NoA----------	0-10	10-27	0.6-2.0	0.17-0.21	7.4-8.4	Low----------	0.43	5	.5-2
Norwood	10-63	10-35	0.6-2.0	0.15-0.22	7.9-8.4	Low----------	0.43		
NrA----------	0-16	27-40	0.6-2.0	0.18-0.22	7.4-8.4	Moderate-------	0.32	5	.5-2
Norwood	16-72	10-35	0.6-2.0	0.15-0.22	7.9-8.4	Low----------	0.43		
OkA----------	0-8	10-18	2.0-6.0	0.13-0.20	7.4-8.4	Low----------	0.32	5	.5-1
Oklared	8-70	10-44	2.0-6.0	0.12-0.16	7.4-8.4	Low----------	0.32		
On*:									
Oklared---------	0-60	10-18	2.0-6.0	0.13-0.20	7.4-8.4	Low----------	0.32	5	.5-1

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
							K	T	
	In	Pct	In/hr	In/in	pH				Pct
On*:									
Norwood	0-8	10-27	0.6-2.0	0.17-0.21	7.4-8.4	Low	0.43	5	.5-2
	8-60	10-35	0.6-2.0	0.15-0.22	7.9-8.4	Low	0.43		
RaA	0-15	5-20	2.0-6.0	0.10-0.15	4.5-6.5	Low	0.32	5	.5-2
Rader	15-23	18-30	0.2-0.6	0.12-0.18	4.5-5.5	Moderate	0.32		
	23-65	35-50	<0.06	0.12-0.18	4.5-6.5	High	0.32		
RaB	0-22	5-20	2.0-6.0	0.10-0.15	4.5-6.5	Low	0.32	5	.5-2
Rader	22-28	18-30	0.2-0.6	0.12-0.18	4.5-5.5	Moderate	0.32		
	28-52	35-50	<0.06	0.12-0.18	4.5-6.5	High	0.32		
	52-78	24-45	0.06-0.2	0.12-0.18	4.5-8.4	Moderate	0.32		
ReF	0-15	15-35	0.6-2.0	0.15-0.20	7.9-8.4	Low	0.32	1	1-3
Renish	15-16	---	---	---	---	---	----		
SeC	0-48	3-12	6.0-20	0.05-0.10	4.5-6.0	Low	0.20	5	<2
Sealy	48-72	18-35	0.2-0.6	0.12-0.17	4.5-6.0	Low	0.32		
SgC	0-15	5-18	0.6-2.0	0.10-0.15	4.5-6.5	Low	0.32	5	<2
Segno	15-36	18-35	0.2-6.0	0.10-0.15	4.5-6.0	Low	0.32		
	36-72	18-35	0.2-6.0	0.08-0.12	4.5-6.0	Low	0.32		
SlC	0-10	5-15	6.0-20	0.07-0.11	5.1-6.5	Very low	0.20	5	<2
Silawa	10-48	18-35	0.6-2.0	0.12-0.17	4.5-6.0	Low	0.32		
	48-65	12-30	2.0-6.0	0.08-0.15	4.5-6.0	Low	0.32		
SlD	0-12	5-15	6.0-20	0.07-0.11	5.1-6.5	Very low	0.20	5	<2
Silawa	12-55	18-35	0.6-2.0	0.12-0.17	4.5-6.0	Low	0.32		
	55-80	12-30	2.0-6.0	0.08-0.15	4.5-6.0	Low	0.32		
	59-70	2-15	6.0-20	0.05-0.11	4.5-6.0	Very low	0.20		
SpB	0-13	3-15	0.6-2.0	0.10-0.18	5.1-6.0	Low	0.37	5	0-2
Splendora	13-36	18-24	0.6-2.0	0.09-0.17	4.5-5.5	Low	0.37		
	36-60	18-30	0.2-0.6	0.09-0.14	4.5-5.5	Low	0.32		
	32-80	18-30	0.06-0.2	0.07-0.11	4.5-5.5	Low	0.32		
SrC	0-16	5-12	2.0-6.0	0.07-0.11	5.6-6.5	Very low	0.24	5	<1
Straber	16-32	35-50	0.06-0.2	0.14-0.18	4.5-5.5	Moderate	0.32		
	32-65	35-50	0.06-0.2	0.14-0.18	4.5-6.0	Moderate	0.32		
	65-75	25-45	0.06-0.2	0.11-0.18	5.6-8.4	Moderate	0.37		
SrD	0-15	5-12	2.0-6.0	0.07-0.11	5.6-6.5	Very low	0.24	5	<1
Straber	15-25	35-50	0.06-0.2	0.14-0.18	4.5-5.5	Moderate	0.32		
	25-40	35-50	0.06-0.2	0.14-0.18	4.5-6.0	Moderate	0.32		
	40-72	25-45	0.06-0.2	0.11-0.18	5.6-8.4	Moderate	0.37		
StC	0-22	3-15	2.0-6.0	0.05-0.11	5.1-7.3	Low	0.17	5	.5-2
Styx	22-80	25-35	0.6-2.0	0.12-0.17	4.5-6.5	Low	0.24		
Su	0-60	60-80	<0.06	0.14-0.19	7.4-8.4	High	0.32	5	1-4
Sumpf									
TaC	0-15	8-20	0.6-2.0	0.11-0.15	5.1-6.5	Low	0.43	5	<1
Tabor	15-62	40-55	<0.06	0.14-0.18	4.5-5.5	High	0.32		
	62-69	25-45	<0.06	0.14-0.18	5.6-8.4	High	0.32		
TeC	0-26	2-10	6.0-20	0.04-0.10	5.1-6.5	Very low	0.24	5	<1
Tremona	26-48	35-50	<0.06	0.12-0.18	4.5-6.0	High	0.28		
	48-70	25-45	<0.06	0.12-0.18	4.5-8.4	High	0.37		
TeD	0-21	2-10	6.0-20	0.04-0.10	5.1-6.5	Very low	0.24	5	<1
Tremona	21-74	35-50	<0.06	0.12-0.18	4.5-6.0	High	0.28		
Tr	0-65	60-80	<0.06	0.15-0.20	7.4-8.4	Very high	0.32	5	1-4
Trinity									

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
							K	T	
	In	Pct	In/hr	In/in	pH				Pct
Wa	0-6	5-15	0.6-2.0	0.15-0.20	4.5-6.0	Low	0.43	5	.5-2
Waller	6-22	5-15	0.6-2.0	0.15-0.20	4.5-6.0	Low	0.43		
	22-65	18-30	0.6-2.0	0.15-0.20	5.6-7.3	Low	0.37		
W1A	0-7	27-40	0.2-0.6	0.15-0.20	5.6-7.3	Low	0.43	5	.5-2
Wilson	7-64	35-50	<0.06	0.14-0.20	5.6-8.4	High	0.37		
W1B	0-8	27-40	0.2-0.6	0.15-0.20	5.6-7.3	Low	0.43	5	.5-2
Wilson	8-61	35-50	<0.06	0.14-0.20	5.6-8.4	High	0.37		
WoA	0-23	8-20	2.0-6.0	0.15-0.20	5.1-6.5	Low	0.32	5	<2
Wockley	23-80	18-35	0.2-0.6	0.12-0.18	4.5-6.0	Low	0.28		
WoB	0-22	8-20	2.0-6.0	0.15-0.20	5.1-6.5	Low	0.32	5	<2
Wockley	22-72	18-35	0.2-0.6	0.12-0.18	4.5-6.0	Low	0.28		

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
AnA, AnC---------- Annona	D	None--------	---	---	2.0-4.0	Apparent	Dec-Feb	>60	---	High-----	Moderate.
ArA---------- Aris	D	None--------	---	---	0.5-2.0	Perched	Nov-Mar	>60	---	High-----	Moderate.
AxC, AxC2, AxD---- Axtell	D	None--------	---	---	>6.0	---	---	>60	---	High-----	Moderate.
BbB---------- Bleiblerville	D	None--------	---	---	>6.0	---	---	>60	---	High-----	Low.
Be---------- Bosque	B	Frequent----	Brief-----	Oct-May	>6.0	---	---	>60	---	High-----	Low.
BoC---------- Boy	B	None--------	---	---	3.5-5.5	Perched	Nov-Feb	>60	---	Moderate	Moderate.
BrA, BrB---------- Brazoria	D	Rare--------	---	---	1.0-3.0	Apparent	Dec-Feb	>60	---	High-----	Low.
Bs---------- Brazoria	D	None--------	---	---	+1-3.0	Apparent	Dec-Feb	>60	---	High-----	Low.
BtD---------- Brenham	C	None--------	---	---	>6.0	---	---	>60	---	High-----	Low.
BuA---------- Burleson	D	None--------	---	---	>6.0	---	---	>60	---	High-----	Low.
CaB, CaC, CaD----- Carbengle	B	None--------	---	---	>6.0	---	---	20-40	Soft	Moderate	Low.
CcD---------- Catilla	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
ChC, ChD---------- Chazos	C	None--------	---	---	>6.0	---	---	>60	---	High-----	High.
Cm---------- Clemville	B	Occasional	Brief-----	Oct-May	>6.0	---	---	>60	---	High-----	Low.
CoC, CpC*--------- Conroe	B	None--------	---	---	2.0-3.5	Perched	Nov-May	>60	---	High-----	High.
CrC, CrC2, CrD---- Crockett	D	None--------	---	---	>6.0	---	---	>60	---	High-----	Low.
CuB, CuC, CuD----- Cuero	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Low.
DeC---------- Depcor	B	None--------	---	---	2.0-3.5	Perched	Oct-May	>60	---	High-----	Moderate.
DuD---------- Dutek	A	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
EdA, EdB---------- Edna	D	None--------	---	---	0-1.5	Perched	Dec-Mar	>60	---	High-----	Low.
EuC---------- Eufaula	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Moderate.
FeC---------- Fetzer	C	None--------	---	---	1.5-3.5	Perched	Oct-May	>60	---	High-----	High.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
FrB, FrC, FrD----- Frelsburg	D	None--------	---	---	>6.0	---	---	>60	---	High-----	Low.
HoB, HoC, HpC----- Hockley	C	None--------	---	---	3.5-5.0	Perched	Dec-Mar	>60	---	Moderate	High.
HzC*---------- Hockley	D	None--------	---	---	3.5-5.0	Perched	Dec-Mar	>60	---	Moderate	High.
KaA, KaB---------- Katy	D	None--------	---	---	0-2.5	Perched	Dec-Jan	>60	---	High-----	Moderate.
KcB*:											
Katy----------	D	None--------	---	---	0-2.5	Perched	Dec-Jan	>60	---	High-----	Moderate.
Edna----------	D	None--------	---	---	0-1.5	Perched	Dec-Mar	>60	---	High-----	Low.
KeD---------- Kenney	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Moderate.
KlC, KlD---------- Klump	B	None--------	---	---	>6.0	---	---	>60	---	Low------	Moderate.
KnC---------- Knolle	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
KuC---------- Kuy	A	None--------	---	---	3.0-5.0	Apparent	Nov-May	>60	---	High-----	Moderate.
KyB*:											
Kuy----------	A	None--------	---	---	3.0-5.0	Apparent	Nov-May	>60	---	High-----	Moderate.
Aris----------	D	None--------	---	---	0.5-2.0	Perched	Nov-Mar	>60	---	High-----	Moderate.
LaA, LaB, LaD----- Lake Charles	D	None--------	---	---	0-2.0	Apparent	Dec-Feb	>60	---	High-----	Low.
LdC---------- Landman	B	None--------	---	---	4.0-6.0	Perched	Oct-May	>60	---	Moderate	Moderate.
LlE*:											
Landman----------	B	None--------	---	---	4.0-6.0	Perched	Oct-May	>60	---	Moderate	Moderate.
Larue----------	A	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
LtC, LtE---------- Latium	D	None--------	---	---	>6.0	---	---	>60	---	High-----	Low.
LuA, LuB---------- Lufkin	D	None--------	---	---	0-1.0	Perched	Oct-Mar	>60	---	High-----	Moderate.
MaA, MaB---------- Mabank	D	None--------	---	---	0.6-1.0	Perched	Dec-Mar	>60	---	High-----	Moderate.
MdA, MdB---------- Midland	D	None--------	---	---	0.5-3.0	Apparent	Dec-Apr	>60	---	High-----	Moderate.
Mp---------- Midland	D	None--------	---	---	+1-2.0	Apparent	Dec-Jun	>60	---	High-----	Moderate.
MvC---------- Monaville	B	None--------	---	---	4.0-5.0	Perched	Dec-Apr	>60	---	High-----	Moderate.
Na---------- Nahatche	C	Frequent----	Brief to long.	Nov-May	0-1.5	Apparent	Nov-May	>60	---	High-----	Moderate.
NeC---------- Newulm	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Moderate.
NoA, NrA---------- Norwood	B	Rare--------	---	---	>6.0	---	---	>60	---	High-----	Low.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
OkA---- Oklared	B	Rare----	---	---	3.5-5.0	Apparent	Mar-May	>60	---	Moderate	Low.
On*:											
Oklared----	B	Frequent----	Very brief	Jan-Jul	3.5-5.0	Apparent	Mar-May	>60	---	Moderate	Low.
Norwood----	B	Frequent----	Very brief	Jan-Jul	>6.0	---	---	>60	---	High----	Low.
RaA, RaB---- Rader	D	None----	---	---	2.0-5.0	Perched	Dec-Mar	>60	---	High----	Moderate.
ReF---- Renish	C	None----	---	---	>6.0	---	---	12-18	Hard	Moderate	Low.
SeC---- Sealy	B	None----	---	---	1.0-3.0	Perched	Oct-Jun	>60	---	High----	High.
SgC---- Segno	C	None----	---	---	2.0-3.0	Perched	Dec-Apr	>60	---	High----	High.
SlC, SlD---- Silawa	B	None----	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
SpB---- Splendora	C	None----	---	---	0.5-2.0	Perched	Dec-May	>60	---	High----	High.
SrC, SrD---- Straber	C	None----	---	---	>6.0	---	---	>60	---	High----	High.
StC---- Styx	B	None----	---	---	3.5-4.5	Perched	Dec-May	>60	---	Moderate	Moderate.
Su---- Sumpf	D	Frequent----	Very long	Sep-Jun	+2-2.0	Apparent	Jan-Dec	>60	---	High----	Low.
TaC---- Tabor	D	None----	---	---	>6.0	---	---	>60	---	High----	High.
TeC, TeD---- Tremona	C	None----	---	---	1.5-3.5	Perched	Jun-Sep	>60	---	High----	High.
Tr---- Trinity	D	Frequent----	Brief to long.	Feb-May	0-3.0	Apparent	Nov-Feb	>60	---	High----	Low.
Wa---- Waller	B/D	None----	---	---	+1-1.0	Apparent	Nov-Jun	>60	---	High----	Moderate.
WlA, WlB---- Wilson	D	None----	---	---	0-1.0	Perched	Nov-Mar	>60	---	High----	High.
WoA, WoB---- Wockley	C	None----	---	---	0-2.0	Perched	Nov-Mar	>60	---	High----	Moderate.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--ENGINEERING INDEX TEST DATA

Soil name, report number, horizon, and depth in inches	Classification		Grain size distribution[1]									Liquid limit[2]	Plasticity index[2]	Specific gravity	Shrinkage		
			Percentage percentage sieve--						Percentage smaller than--								
	AASHTO	Unified	5/8 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	.05 mm	.005 mm	.002 mm				Limit	Linear	Ratio
												Pct		G/cm^3	Pct	Pct	Pct
Brenham clay loam:[3, 4] (S78TX-015-003)																	
Ap---------- 0- 8	A-6(6)	SC	---	---	---	100	96	49	45	26	20	37	19	2.61	19.0	8.5	1.73
B21ca---------17-30	A-7-6(22)	CL	100	99	98	97	96	89	87	59	38	45	22	2.65	23.0	9.6	1.64
C1ca----------43-61	A-7-6(22)	CL	---	---	100	99	97	93	91	47	31	41	23	2.70	21.0	9.7	1.73
Depcor loamy fine sand:[5] (S77TX-473-002)																	
A2---------- 6-22	A-2-4(0)	SM	---	100	99	99	97	28	23	4	2	15	1	2.66	15.0	0.0	1.76
B21t---------22-28	A-6(2)	SC	---	100	99	98	96	42	40	27	25	28	15	2.64	15.0	7.4	1.87
B22t---------28-40	A-6(4)	SC	100	96	85	78	75	38	38	27	26	38	25	2.67	15.0	11.6	1.88
B23t---------40-51	A-7-6(4)	SC	100	99	90	84	81	41	40	31	29	35	21	2.67	15.0	10.4	1.88
Fetzer loamy fine sand:[5] (S78TX-473-002)																	
A21---------- 6-24	A-2-4(0)	SM	---	---	---	100	96	28	22	4	2	16	1	2.64	13.0	0.3	1.89
B21tg---------28-39	A-6-7(7)	SC	---	100	99	98	93	49	46	35	34	39	24	2.66	15.0	11.3	1.85
B22tg---------39-74	A-6(11)	SC, CL	---	---	100	99	95	50	47	33	32	36	22	2.67	14.0	11.4	1.92
Hockley fine sandy loam:[5] (S78TX-473-003)																	
A12---------- 7-22	A-2-4(0)	SM	---	---	100	99	96	30	19	4	4	18	1	2.62	17.0	0.0	1.72
B21t---------22-32	A-7-6(12)	CL	---	100	94	89	82	53	48	38	36	48	31	2.67	15.0	14.8	1.87
B22t---------32-45	A-7-6(14)	CL	---	100	95	90	82	57	53	43	42	48	30	2.70	14.0	15.1	1.90
Katy fine sandy loam:[5] (S77TX-473-004)																	
A2----------10-22	A-4(2)	ML	---	100	99	98	98	59	46	12	8	17	3	2.63	16.0	1.2	1.83
B21t---------22-29	A-4(3)	CL	---	100	99	98	97	63	48	19	18	23	8	2.65	16.0	4.0	1.84
B22t---------29-50	A-6(26)	CL	---	---	100	99	99	77	69	44	41	34	34	2.66	12.0	16.6	1.98
Knolle loamy sand:[5] (578TX-015-001)																	
Ap---------- 0- 8	A-2-4(0)	SM	---	---	---	100	98	13	11	6	5	22	3	2.63	19.0	1.0	1.67
B21t---------18-30	A-7-6(6)	SC	---	---	---	100	99	46	45	42	41	43	21	2.67	20.0	10.3	1.72
B22t---------30-45	A-7-6(2)	SC	---	---	---	---	100	36	35	33	31	41	21	2.65	20.0	9.6	1.70
Landman loamy fine sand:[5] (S77TX-473-001)																	
A21---------- 6-45	A-2-4(0)	SM	---	---	---	100	90	17	17	5	5	15	2	2.65	14.0	0.0	1.83
A22----------45-65	A-2-4(0)	SM	---	---	---	100	91	19	17	5	3	14	1	2.63	14.0	0.0	1.79
B22t---------70-80	A-2-6(1)	SC	---	---	---	100	78	34	33	25	23	28	18	2.66	14.0	7.8	1.91

See footnote at end of table.

TABLE 18.--ENGINEERING INDEX TEST DATA--Continued

Soil name, report number, horizon, and depth in inches	Classification		Grain size distribution[1]									Liquid limit[2]	Plasticity index[2]	Specific gravity	Shrinkage		
			Percentage percentage sieve--						Percentage smaller than--								
	AASHTO	Unified	5/8 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	.05 mm	.005 mm	.002 mm				Limit	Linear	Ratio
												Pct		G/cm^3	Pct	Pct	Pct
Monaville loamy fine sand:[5] (S78TX-473-001)																	
A2----------15-28	A-2-4(0)	SM	---	---	---	100	98	25	20	8	6	17	3	2.62	14.0	1.1	1.85
B21----------28-34	A-6(0)	SC	---	100	99	99	97	36	32	18	16	24	12	2.66	15.0	4.7	1.86
B22t----------41-53	A-6(5)	SC	---	100	98	97	95	46	43	29	28	34	21	2.67	14.0	10.1	1.90
Newulm loamy fine sand:[5] (S78TX-015-002)																	
A2---------- 4-22	A-2-4(0)	SP-SM	---	---	---	100	85	6	5	4	2	20	2	2.63	17.0	0.0	1.73
B2t----------22-31	A-2-6(2)	SC	---	100	99	99	80	35	35	32	31	37	20	2.65	17.0	9.7	1.81
B3----------31-60	A-2-6(1)	SC	---	---	---	100	73	23	22	21	20	36	20	2.66	18.0	8.8	1.77
Sealy loamy fine sand:[5] (S78TX-015-004)																	
A22g----------18-48	A-2-4(0)	SM	---	---	---	100	82	19	16	6	4	15	2	2.64	13.0	1.0	1.87
B21tg----------48-62	A-2-4(0)	SC	---	100	99	99	83	26	26	18	16	21	9	2.66	14.0	4.3	1.89
Styx loamy fine sand:[5, 6] (S78TX-473-004)																	
A2----------10-22	A-2-4(0)	SM	---	---	---	100	99	31	25	8	7	17	2	2.63	1.50	1.2	1.83
B22t----------28-38	A-6(6)	SC	---	---	---	100	99	50	45	33	32	36	20	2.66	16.0	9.7	1.83
B3----------48-80	A-6(2)	SC	---	---	---	---	100	36	31	24	23	34	18	2.66	18.0	7.7	1.76
Wockley fine sandy loam:[5] (S77TX-473-003)																	
Ap---------- 0-12	A-4(0)	SM	---	100	99	99	96	47	39	10	8	17	3	2.63	16.0	1.2	1.85
B21t----------23-32	A-6(6)	CL	100	99	93	90	84	52	47	29	28	33	20	2.66	14.0	9.4	1.90
B22t----------32-56	A-6(6)	SC	100	99	89	85	81	49	45	25	24	32	20	2.64	13.0	10.1	1.93
B23t----------56-80	A-7-6(11)	CL	100	98	92	89	84	53	50	34	33	43	29	2.66	12.0	14.4	1.95

[1] For soil materials larger than 3/8 inch, square mesh wire sieves were used that are slightly larger than equivalent round sieves, but these differences do not seriously affect the data.

[2] Liquid limit and plasticity index values were determined by the AASHTO-89 and AASHTO-90 methods except that soil was added to water.

[3] Brenham clay loam: From Bleiblerville, 1 mile southwest on Farm Road 2502, 100 feet west of road in pasture.

[4] This soil is a taxadjunct to the Brenham series because the Ap horizon is too sandy.

[5] Location of pedon sample is the same as the pedon given as typical for series in "Soil series and their morphology."

[6] This soil is a taxadjunct to the Styx series. The text describes those characteristics of this soil that are outside the range for the series.

TABLE 19.--CLASSIFICATION OF THE SOILS

[An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series]

Soil name	Family or higher taxonomic class
Annona	Fine, montmorillonitic, thermic Vertic Paleudalfs
*Aris	Fine, mixed, thermic Typic Glossaqualfs
Axtell	Fine, montmorillonitic, thermic Udertic Paleustalfs
Bleiblerville	Fine, montmorillonitic, thermic Udic Pellusterts
Bosque	Fine-loamy, mixed, thermic Cumulic Haplustolls
Boy	Loamy, siliceous, thermic Grossarenic Plinthic Paleudalfs
Brazoria	Very-fine, mixed, thermic Typic Chromuderts
Brenham	Fine-silty, carbonatic, thermic Typic Calciustolls
Burleson	Fine, montmorillonitic, thermic Udic Pellusterts
Carbengle	Fine-loamy, carbonatic, thermic Typic Calciustolls
Catilla	Loamy, siliceous, thermic Grossarenic Paleustalfs
Chazos	Fine, mixed, thermic Aquic Paleustalfs
Clemville	Fine-silty, mixed (calcareous), thermic Typic Udifluvents
Conroe	Clayey, kaolinitic, thermic Arenic Plinthic Paleudults
Crockett	Fine, montmorillonitic, thermic Udertic Paleustalfs
Cuero	Fine-loamy, mixed, thermic Pachic Argiustolls
Depcor	Loamy, siliceous, thermic Arenic Paleudalfs
Dutek	Loamy, siliceous, thermic Arenic Haplustalfs
Edna	Fine, montmorillonitic, thermic Vertic Albaqualfs
Eufaula	Sandy, siliceous, thermic Psammentic Paleustalfs
Fetzer	Fine-loamy, siliceous, thermic Aquic Paleudalfs
Frelsburg	Fine, montmorillonitic, thermic Udorthentic Pellusterts
Hockley	Fine-loamy, siliceous, thermic Plinthic Paleudalfs
Katy	Fine-loamy, siliceous, thermic Aquic Paleudalfs
Kenney	Loamy, siliceous, thermic Grossarenic Paleudalfs
Klump	Fine-loamy, siliceous, thermic Udic Argiustolls
Knolle	Fine-loamy, siliceous, thermic Ultic Haplustalfs
*Kuy	Loamy, siliceous, hyperthermic Grossarenic Paleudalfs
*Lake Charles	Fine, montmorillonitic, thermic Typic Pelluderts
Landman	Loamy, siliceous, thermic Grossarenic Paleudalfs
Larue	Loamy, siliceous, thermic Arenic Paleudalfs
Latium	Fine, montmorillonitic, thermic Udorthentic Chromusterts
Lufkin	Fine, montmorillonitic, thermic Vertic Albaqualfs
*Mabank	Fine, montmorillonitic, thermic Vertic Albaqualfs
Midland	Fine, montmorillonitic, thermic Typic Ochraqualfs
Monaville	Loamy, siliceous, thermic Arenic Plinthic Paleudalfs
Nahatche	Fine-loamy, mixed, nonacid, thermic Aeric Fluvaquents
Newulm	Loamy, siliceous, thermic Arenic Haplustults
Norwood	Fine-silty, mixed (calcareous), thermic Typic Udifluvents
Oklared	Coarse-loamy, mixed (calcareous), thermic Typic Udifluvents
Rader	Fine-loamy, mixed, thermic Aquic Paleustalfs
Renish	Loamy, mixed, thermic Lithic Haplustolls
Sealy	Loamy, siliceous, thermic Grossarenic Ochraqualfs
Segno	Fine-loamy, siliceous, thermic Plinthic Paleudalfs
Silawa	Fine-loamy, siliceous, thermic Ultic Haplustalfs
Splendora	Fine-loamy, siliceous, thermic Fragic Glossudalfs
Straber	Fine, mixed, thermic Aquic Paleustalfs
*Styx	Loamy, siliceous, thermic Arenic Paleustalfs
Sumpf	Very-fine, mixed (calcareous), thermic Cumulic Haplaquolls
Tabor	Fine, montmorillonitic, thermic Udertic Paleustalfs
Tremona	Clayey, mixed, thermic Aquic Arenic Paleustalfs
Trinity	Very-fine, montmorillonitic, thermic Typic Pelluderts
Waller	Fine-loamy, siliceous, thermic Typic Glossaqualfs
Wilson	Fine, montmorillonitic, thermic Vertic Ochraqualfs
Wockley	Fine-loamy, siliceous, thermic Plinthaquic Paleudalfs

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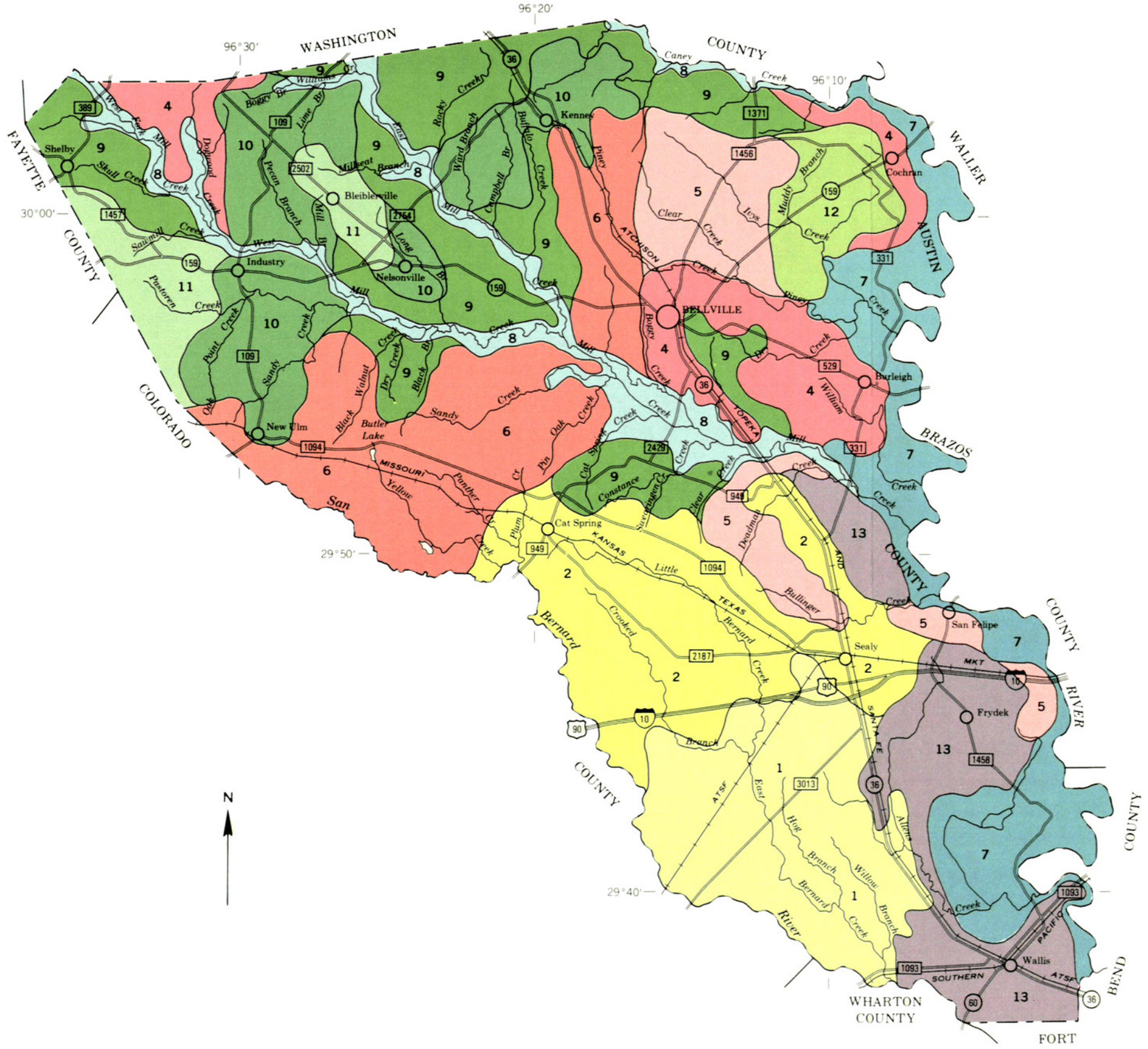


LEGEND

(NOT ALL SOIL ASSOCIATIONS OCCUR IN BOTH COUNTIES)

LOAMY AND SANDY SOILS OF PRAIRIES

1 — Katy association: Nearly level to gently sloping, somewhat poorly drained, loamy soils

2 — Hockley-Wockley-Monaville association: Nearly level to gently sloping, moderately well drained and somewhat poorly drained, loamy and sandy soils

3 — Wockley-Hockley association: Nearly level to gently sloping, somewhat poorly drained and moderately well drained, loamy soils

SANDY AND LOAMY SOILS OF SAVANNAHS

4 — Tabor-Tremona-Chazos association: Gently sloping to sloping, moderately well drained and somewhat poorly drained, loamy and sandy soils

5 — Kenney-Tabor-Chazos association: Gently sloping to sloping, well drained and moderately well drained, sandy and loamy soils

6 — Catilla-Tremona association: Nearly level to sloping, moderately well drained and somewhat poorly drained, sandy soils

CLAYEY AND LOAMY SOILS OF FLOOD PLAINS

7 — Brazoria-Norwood association: Nearly level to gently sloping, somewhat poorly drained and well drained, clayey and loamy soils

8 — Trinity association: Nearly level, somewhat poorly drained, clayey soils

CLAYEY AND LOAMY SOILS OF BLACKLANDS

9 — Frelsburg-Latium-Crockett association: Gently sloping to strongly sloping, well drained and moderately well drained, clayey and loamy soils

10 — Klump-Carbengle-Brenham association: Gently sloping to sloping, well drained, loamy soils

11 — Frelsburg-Bleiblerville-Latium association: Gently sloping to strongly sloping, well drained and moderately well drained, clayey soils

12 — Wilson-Burleson association: Nearly level to gently sloping, somewhat poorly drained and moderately well drained, loamy and clayey soils

CLAYEY AND LOAMY SOILS OF PRAIRIES

13 — Lake Charles-Midland-Edna association: Nearly level to gently sloping, somewhat poorly drained and poorly drained, clayey and loamy soils

SANDY AND LOAMY SOILS OF TIMBERLANDS

14 — Depcor-Splendora-Boy association: Nearly level to gently sloping, moderately well drained and somewhat poorly drained, sandy and loamy soils

15 — Conroe-Landman association: Gently sloping to strongly sloping, moderately well drained, sandy soils

* Texture terms refer to the surface layer of the major soils

Compiled 1982

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

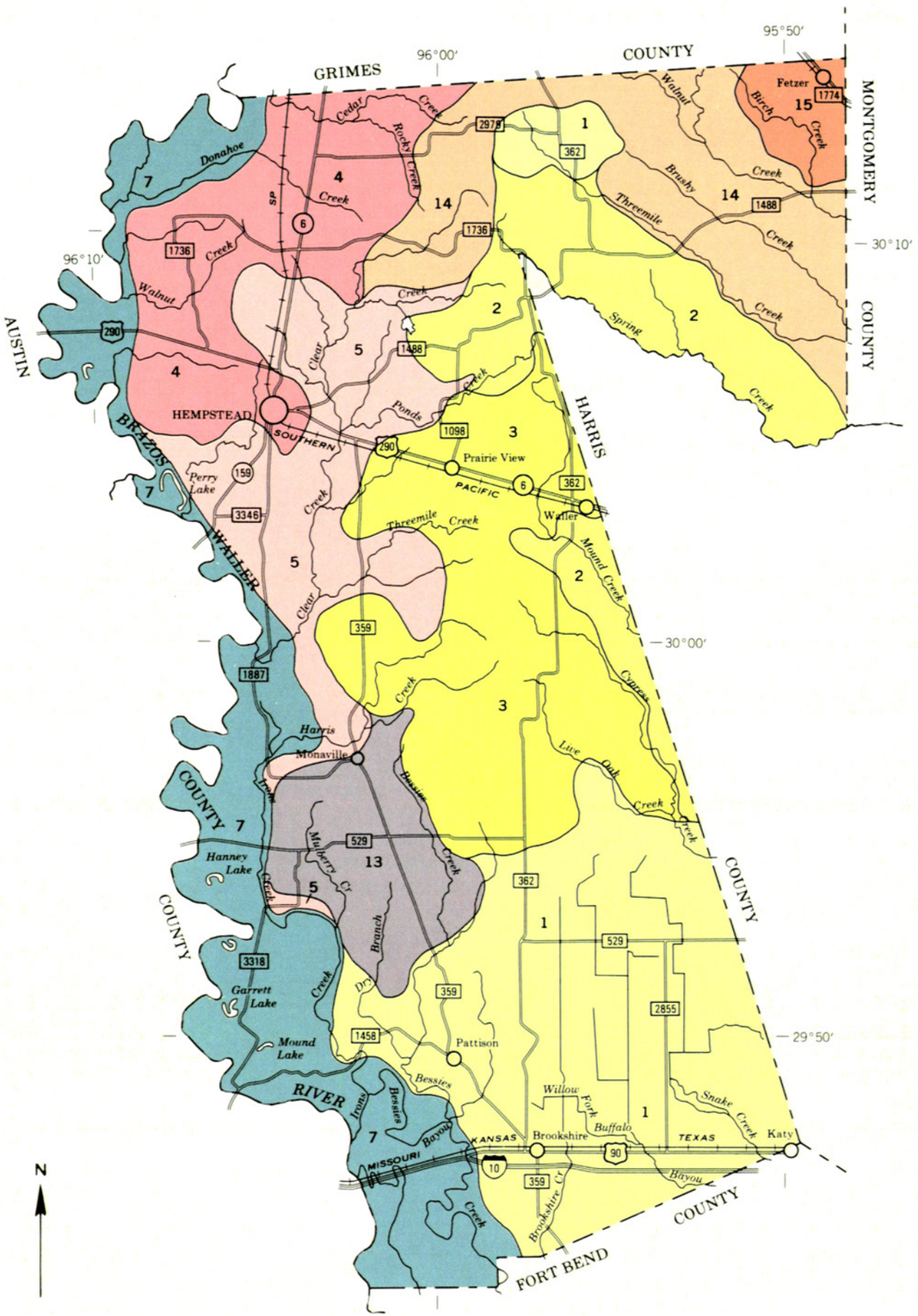
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
TEXAS AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP
AUSTIN COUNTY, TEXAS

Scale 1:253,440

1 0 1 2 3 4 Miles

1 0 4 8 Km



N

LEGEND

(NOT ALL SOIL ASSOCIATIONS OCCUR IN BOTH COUNTIES)

LOAMY AND SANDY SOILS OF PRAIRIES

1 — Katy association: Nearly level to gently sloping, somewhat poorly drained, loamy soils

2 — Hockley-Wockley-Monaville association: Nearly level to gently sloping, moderately well drained and somewhat poorly drained, loamy and sandy soils

3 — Wockley-Hockley association: Nearly level to gently sloping, somewhat poorly drained and moderately well drained, loamy soils

SANDY AND LOAMY SOILS OF SAVANNAHS

4 — Tabor-Tremona-Chazos association: Gently sloping to sloping, moderately well drained and somewhat poorly drained, loamy and sandy soils

5 — Kenney-Tabor-Chazos association: Gently sloping to sloping, well drained and moderately well drained, sandy and loamy soils

6 — Catilla-Tremona association: Nearly level to sloping, moderately well drained and somewhat poorly drained, sandy soils

CLAYEY AND LOAMY SOILS OF FLOOD PLAINS

7 — Brazoria-Norwood association: Nearly level to gently sloping, somewhat poorly drained and well drained, clayey and loamy soils

8 — Trinity association: Nearly level, somewhat poorly drained, clayey soils

CLAYEY AND LOAMY SOILS OF BLACKLANDS

9 — Frelsburg-Latium-Crockett association: Gently sloping to strongly sloping, well drained and moderately well drained, clayey and loamy soils

10 — Klump-Carbengle-Brenham association: Gently sloping to sloping, well drained, loamy soils

11 — Frelsburg-Bleiblerville-Latium association: Gently sloping to strongly sloping, well drained and moderately well drained, clayey soils

12 — Wilson-Burleson association: Nearly level to gently sloping, somewhat poorly drained and moderately well drained, loamy and clayey soils

CLAYEY AND LOAMY SOILS OF PRAIRIES

13 — Lake Charles-Midland-Edna association: Nearly level to gently sloping, somewhat poorly drained and poorly drained, clayey and loamy soils

SANDY AND LOAMY SOILS OF TIMBERLANDS

14 — Depcor-Splendora-Boy association: Nearly level to gently sloping, moderately well drained and somewhat poorly drained, sandy and loamy soils

15 — Conroe-Landman association: Gently sloping to strongly sloping, moderately well drained, sandy soils

* Texture terms refer to the surface layer of the major soils

Compiled 1982

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
TEXAS AGRICULTURAL EXPERIMENT STATION

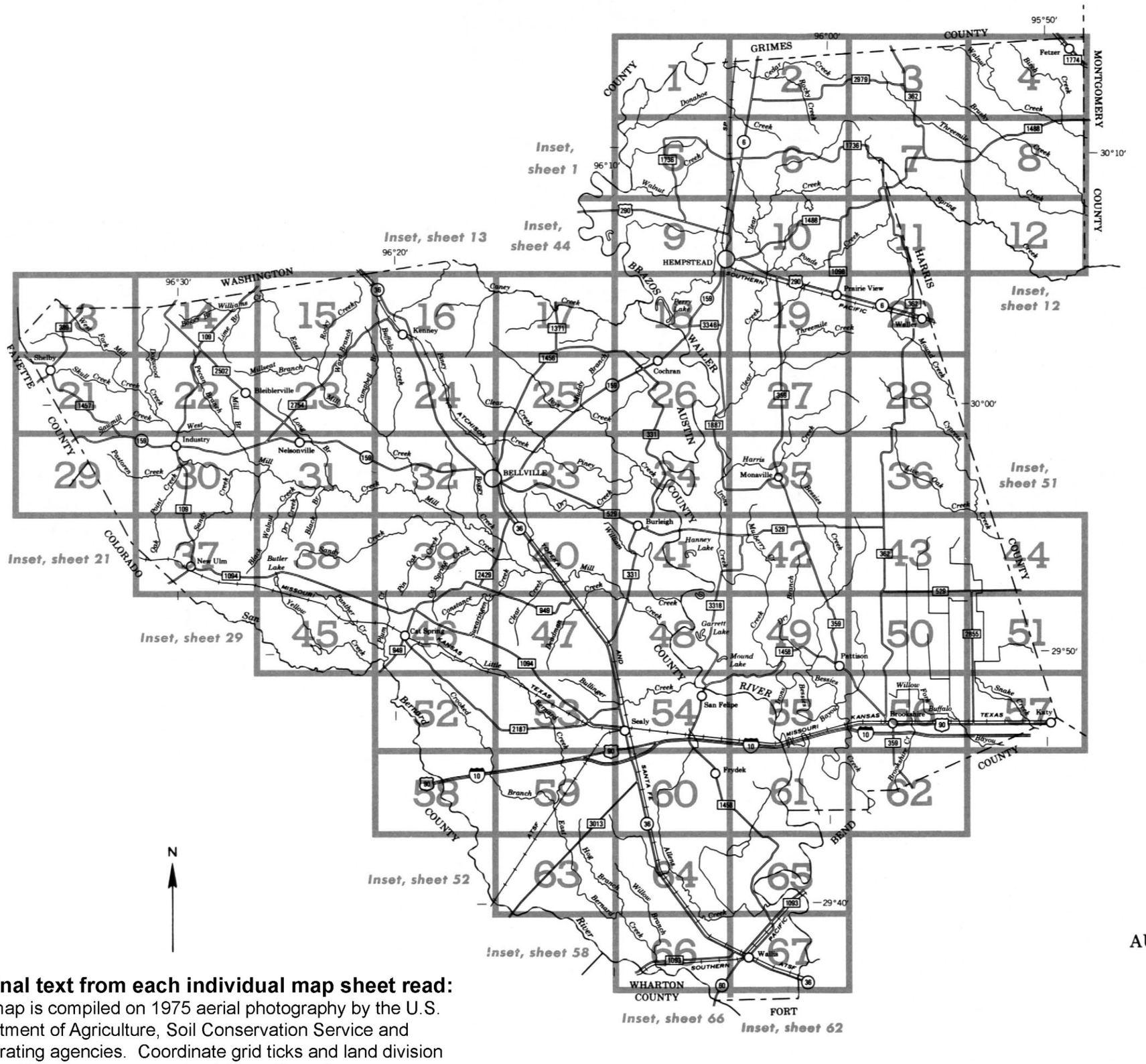
GENERAL SOIL MAP

WALLER COUNTY, TEXAS

Scale 1:253,440

1 0 1 2 3 4 Miles

1 0 4 8 Km



INDEX TO MAP SHEETS

AUSTIN AND WALLER COUNTIES, TEXAS

Scale 1:316,800

1 0 1 2 3 4 5 Miles

1 0 5 10 Km

Original text from each individual map sheet read:

This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL LEGEND

The map symbols recommended for publication are alphabetic letters. The first capital letter is the initial one of the soil name. The second letter is a lowercase letter. The third letter is a capital letter used to show slope. Symbols without a slope letter are for nearly level soils.

SYMBOL	NAME
AnA	Annona fine sandy loam, 0 to 1 percent slopes
AnC	Annona fine sandy loam, 1 to 5 percent slopes
ArA	Aris fine sandy loam, 0 to 1 percent slopes
AxC	Axtell fine sandy loam, 1 to 5 percent slopes
AxC2	Axtell fine sandy loam, 2 to 5 percent slopes, eroded
AxD	Axtell fine sandy loam, 5 to 8 percent slopes
BbB	Bleiblerville clay, 1 to 3 percent slopes
Be	Bosque clay loam, frequently flooded
BoC	Boy loamy fine sand, 1 to 5 percent slopes
BrA	Brazoria clay, 0 to 1 percent slopes
BrB	Brazoria clay, 1 to 3 percent slopes
Bs	Brazoria clay, depressional
BtD	Brenham clay loam, 3 to 8 percent slopes
BuA	Burleson clay, 0 to 1 percent slopes
CaB	Carbengle clay loam, 1 to 3 percent slopes
CaC	Carbengle clay loam, 3 to 5 percent slopes
CaD	Carbengle clay loam, 5 to 8 percent slopes
CcD	Catilla loamy fine sand, 0 to 8 percent slopes
ChC	Chazos loamy fine sand, 1 to 5 percent slopes
ChD	Chazos loamy fine sand, 5 to 8 percent slopes
Cm	Clemville silt loam, occasionally flooded
CoC	Conroe loamy fine sand, 1 to 5 percent slopes
CpC	Conroe soils, graded, 1 to 5 percent slopes
CrC	Crockett fine sandy loam, 1 to 5 percent slopes
CrC2	Crockett fine sandy loam, 2 to 5 percent slopes, eroded
CrD	Crockett fine sandy loam 5 to 8 percent slopes
CuB	Cuero loam, 1 to 3 percent slopes
CuC	Cuero loam, 3 to 5 percent slopes
CuD	Cuero loam, 5 to 8 percent slopes
DeC	Depcor loamy fine sand, 1 to 5 percent slopes
DuD	Dutek loamy fine sand, 5 to 8 percent slopes
EdA	Edna fine sandy loam, 0 to 1 percent slopes
EdB	Edna fine sandy loam, 1 to 3 percent slopes
EuC	Eufaula fine sand, 0 to 5 percent slopes
FeC	Fetzer loamy fine sand, 1 to 5 percent slopes
FrB	Frelsburg clay, 1 to 3 percent slopes
FrC	Frelsburg clay, 3 to 5 percent slopes
FrD	Frelsburg clay, 5 to 8 percent slopes
HoB	Hockley fine sandy loam, 1 to 3 percent slopes
HoC	Hockley fine sandy loam, 3 to 5 percent slopes
HpC	Hockley gravelly fine sandy loam, 1 to 5 percent slopes
HzC	Hockley soils, graded, 1 to 5 percent slopes
KaA	Katy fine sandy loam, 0 to 1 percent slopes
KaB	Katy fine sandy loam, 1 to 3 percent slopes
KcB	Katy-Edna complex, 0 to 3 percent slopes
KeD	Kenney loamy fine sand, 1 to 8 percent slopes
KlC	Klump sandy loam, 3 to 5 percent slopes
KlD	Klump sandy loam, 5 to 8 percent slopes
KnC	Knolle loamy sand, 1 to 5 percent slopes
KuC	Kuy loamy fine sand, 1 to 5 percent slopes
KyB	Kuy-Aris complex, 0 to 3 percent slopes
LaA	Lake Charles clay, 0 to 1 percent slopes
LaB	Lake Charles clay, 1 to 3 percent slopes
LaD	Lake Charles clay, 3 to 8 percent slopes
LdC	Landman loamy fine sand, 1 to 5 percent slopes
LlE	Landman-Larue complex, 3 to 12 percent slopes
LtC	Latium clay, 2 to 5 percent slopes
LtE	Latium clay, 5 to 12 percent slopes
LuA	Lufkin fine sandy loam, 0 to 1 percent slopes
LuB	Lufkin fine sandy loam, 1 to 3 percent slopes
MaA	Mabank fine sandy loam, 0 to 1 percent slopes
MaB	Mabank fine sandy loam, 1 to 3 percent slopes
MdA	Midland clay loam, 0 to 1 percent slopes
MdB	Midland clay loam, 1 to 3 percent slopes
Mp	Midland clay loam, depressional
MvC	Monaville loamy fine sand, 1 to 5 percent slopes
Na	Nahatche loam, frequently flooded
NeC	Newulm loamy fine sand, 1 to 5 percent slopes
NoA	Norwood silt loam, 0 to 1 percent slopes
NrA	Norwood silty clay loam, 0 to 1 percent slopes
OkA	Oklared very fine sandy loam, 0 to 1 percent slopes
On	Oklared-Norwood complex, frequently flooded
RaA	Rader fine sandy loam, 0 to 1 percent slopes
RaB	Rader fine sandy loam, 1 to 3 percent percent slopes
ReF	Renish clay loam, 5 to 20 percent slopes
SeC	Sealy loamy fine sand, 0 to 5 percent slopes
SgC	Segno fine sandy loam, 1 to 5 percent slopes
SlC	Silawa loamy fine sand, 1 to 5 percent slopes
SlD	Silawa loamy fine sand, 5 to 8 percent slopes
SpB	Splendora fine sandy loam, 0 to 3 percent slopes
SrC	Straber loamy fine sand, 1 to 5 percent slopes
SrD	Straber loamy fine sand, 5 to 8 percent slopes
StC	Styx loamy fine sand, 1 to 5 percent slopes
Su	Sumpf clay, frequently flooded
TaC	Tabor fine sandy loam, 1 to 5 percent slopes
TeC	Tremona loamy fine sand, 1 to 5 percent slopes
TeD	Tremona loamy fine sand, 5 to 8 percent slopes
Tr	Trinity clay, frequently flooded
Wa	Waller loam, depressional
WlA	Wilson clay loam, 0 to 1 percent slopes
WlB	Wilson clay loam 1 to 3 percent slopes
WoA	Wockley fine sandy loam, 0 to 1 percent slopes
WoB	Wockley fine sandy loam, 1 to 3 percent slopes

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline

AD HOC BOUNDARY (label) — Hedley Airstrip

Small airport, airfield, park, oilfield, cemetery, or flood pool — FLOOD POOL LINE

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEM & DESIGNATIONS

- Interstate — 21
- Federal — 173
- State — 28
- County, farm or ranch — 1283

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or small — water

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label) — Indian Mound
- Located object (label) — Tower
- Tank (label) — Gas
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label) — CANAL
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial — water, w
- Intermittent — int, i

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS — CnB, WaC2

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

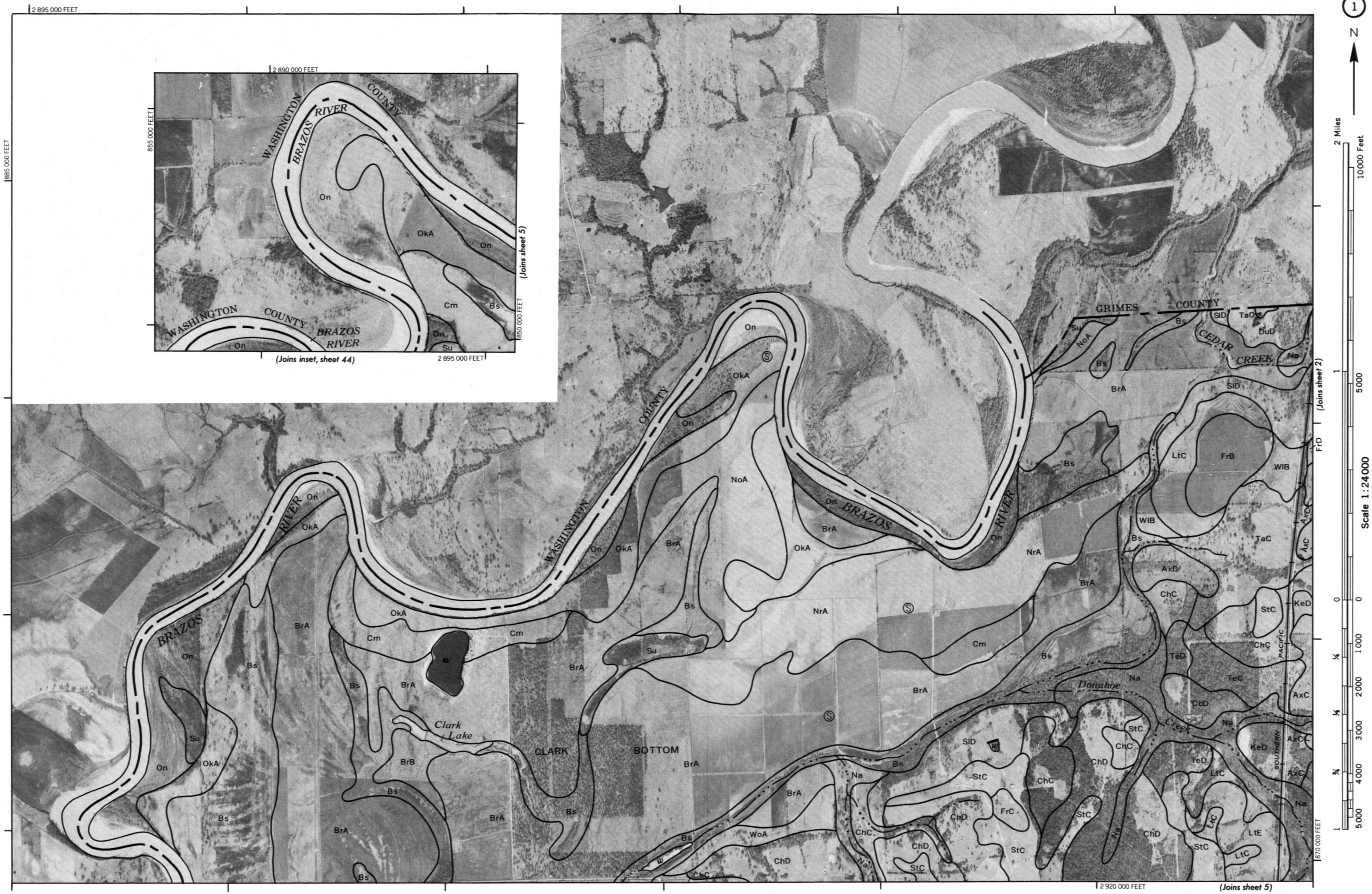
GULLY

DEPRESSION OR SINK

SOIL SAMPLE SITE (normally not shown)

MISCELLANEOUS

- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot — 0


1
N
2 895 000 FEET
885 000 FEET
2 890 000 FEET
855 000 FEET
850 000 FEET
2 895 000 FEET
(Joins inset, sheet 44)
(Joins sheet 5)
WASHINGTON COUNTY
BRAZOS RIVER
On
OkA
Cm
Bs
Su
GRIMES COUNTY
CEDAR CREEK
WASHINGTON COUNTY
BRAZOS RIVER
CLARK BOTTOM
Clark Lake
Donahoe Creek
SOUTHERN PACIFIC
NoA
NrA
BrA
BrB
SlD
TaC
DuD
Na
LtC
FrB
WlB
AxD
ChC
StC
KeD
AxC
TeD
TeC
CcD
ChD
FrC
WoA
LtE
FrD
(Joins sheet 2)
870 000 FEET
2 920 000 FEET
(Joins sheet 5)
Scale 1:24 000
2 Miles
10 000 Feet
5000
1000
2000
3000
4000
0
1


2
N
Scale 1:24 000
2 Miles
10 000 Feet
2 950 000 FEET
885 000 FEET
870 000 FEET
2 925 000 FEET
(Joins sheet 1)
(Joins sheet 3)
(Joins sheet 6)
GRIMES
COUNTY
CEDAR
CREEK
Rocky
Creek
Big
Sandy
Creek
Donahoe
Creek
GRAVEL PIT
SOUTHERN
PACIFIC
Cedar Creek
2979
6

N

2 955 000 FEET

885 000 FEET

GRIMES COUNTY

Walnut Creek

Threemile Creek

TeC TeD FrC BoC ChC WoA ArA LuB CoC CpC TaC MvC DeC FeC SpB Wa WoB KaA KaB AnC HoB MdA MdB HpC EdA ChC DeQ LuA CpC HoC FrB LfE

2979 362

(Joins sheet 2)

(Joins sheet 4)

(Joins sheet 7)

2 980 000 FEET

875 000 FEET

2 Miles

10000 Feet

5000

Scale 1:24000

1 0 1 2 3 4 5000 4000 3000 2000 1000 0

4

N

3 010 000 FEET

890 000 FEET

GRIMES COUNTY

MONTGOMERY COUNTY

Fetzer

Missouri Pacific

1774

Birch Creek

Walnut Creek

Bruseh Creek

2 Miles

10000 Feet

Scale 1:24000

5000

0

1000

2000

3000

4000

5000

875 000 FEET

2 985 000 FEET

(Joins sheet 3)

(Joins sheet 8)

AUSTIN AND WALLER COUNTIES, TEXAS — SHEET NUMBER 5

5

N

2 895 000 FEET

865 000 FEET

(Joins sheet 1)

(Joins inset,sheet 1)

(Joins sheet 6)

(Joins sheet 9)

2 925 000 FEET

850 000 FEET

BRAZOS COUNTY

WASHINGTON COUNTY

RIVER

Creek

Donahoe

Walnut

Bayou

water

PACIFIC

SOUTHERN

1736

Scale 1:24000

2 Miles

10000 Feet.

5000

6

N

2 Miles 10000 Feet

1 5000

Scale 1:24000

0 0

1/4 1000

1/2 2000

3/4 3000

4000

1 5000

(Joins sheet 2)

2 950 000 FEET

870 000 FEET

(Joins sheet 5)

(Joins sheet 7)

850 000 FEET

2 925 000 FEET

(Joins sheet 10)

Donahoe Creek

Howth

Rolling Hills

Gladish Creek

Clear Creek

SOUTHERN PACIFIC

1736

water

(Joins sheet 3)

2 955 000 FEET

870 000 FEET

(Joins sheet 6)

(Joins sheet 8)

(Joins sheet 11)

2 980 000 FEET

855 000 FEET

7

N

Scale 1:24000

2 Miles 1

10000 Feet 5000 0

1 5000 4000 3000 2000 1000 0

AUSTIN AND WALLER COUNTIES, TEXAS — SHEET NUMBER 8

8

N

Scale 1:24000

2 Miles 10000 Feet

1 5000 0 1000 2000 3000 4000 5000

(Joins sheet 4)

(Joins sheet 7)

(Joins sheet 12)

3 010 000 FEET

870 000 FEET

855 000 FEET

2 985 000 FEET

MONTGOMERY COUNTY

Birch Creek

Walnut Creek

Bittersweet Creek

Threemile Creek

1488

water

SpB DeC LIE CoC AnC SgC FeC BoC LdC Na HoB AnA WoA Wa EdA

2 900 000 FEET

(Joins sheet 5)

850 000 FEET

(Joins inset, sheet 44)

(Joins sheet 10)

(Joins sheet 18)

2 925 000 FEET

835 000 FEET

BRAZOS RIVER

WASHINGTON COUNTY

Walnut Bayou

Lawsville Creek

SOUTHERN PACIFIC

HEMPSTEAD (County seat)

water

Bs OkA Cm BrA CrC BuA SlC AxC2 MaB WlB MaA KeD ChC TaC RaA RaB StC Na AxD FrB FrC LuA On Su BrB WlA SlD TeC

9

N

2 Miles

10000 Feet

Scale 1:24000

5000 4000 3000 2000 1000 0 0 1000 2000 3000 4000 5000

10

N

(Joins sheet 6)

2 950 000 FEET

850 000 FEET

2 Miles

10000 Feet

Scale 1:24000

5000

(Joins sheet 9)

835 000 FEET

HEMPSTEAD (county seat)

1488

290

1098

SOUTHERN PACIFIC

PRAIRIE VIEW A&M UNIVERSITY AIRFIELD

SEWAGE DISPOSAL

PRAIRIE VIEW A&M UNIVERSITY

PRAIRIE VIEW

Clear Creek

Ponds Creek

water

(Joins sheet 19)

2 930 000 FEET

(Joins sheet 11)

AUSTIN AND WALLER COUNTIES, TEXAS — SHEET NUMBER 11

11

N

2 955 000 FEET

2 980 000 FEET

2 935 000 FEET

2 850 000 FEET

(Joins sheet 7)

(Joins sheet 10)

(Joins sheet 12)

(Joins sheet 20)

HARRIS COUNTY

Spring Creek

Ponds Creek

2 Miles

10000 Feet

Scale 1:24000

AUSTIN AND WALLER COUNTIES, TEXAS — SHEET NUMBER 12

12

N

(Joins sheet 8)

3 010 000 FEET

850 000 FEET

(Joins sheet 11)

835 000 FEET

2 985 000 FEET

(Joins inset)

2 Miles

10000 Feet

1 5000

Scale 1:24000

0 0

¼ 1000

½ 2000

¾ 3000

1 4000

1¼ 5000

1000 AND 5000-FOOT GRID TICKS

(Joins lower right)

3 005 000 FEET

831000 FEET

832000 FEET

3 000 000 FEET

CoC HoB WoA SgC FeC LIE SpB DeC BoC CpC ArA Na LdC

Threemile Creek

Brushy Creek

Spring Creek

water

HARRIS COUNTY

MONTGOMERY COUNTY

13

N

2 750 000 FEET

825 000 FEET

2 840 000 FEET

829 000 FEET

(Joins sheet 15)

WASHINGTON COUNTY

Caney Creek

830 000 FEET

(Joins sheet 16)

2 860 000 FEET

1000 AND 5000-FOOT GRID TICKS

WASHINGTON COUNTY

West Fork Mill Creek

FAYETTE COUNTY

810 000 FEET

(Joins sheet 14)

(Joins sheet 21)

2 775 000 FEET

2 Miles

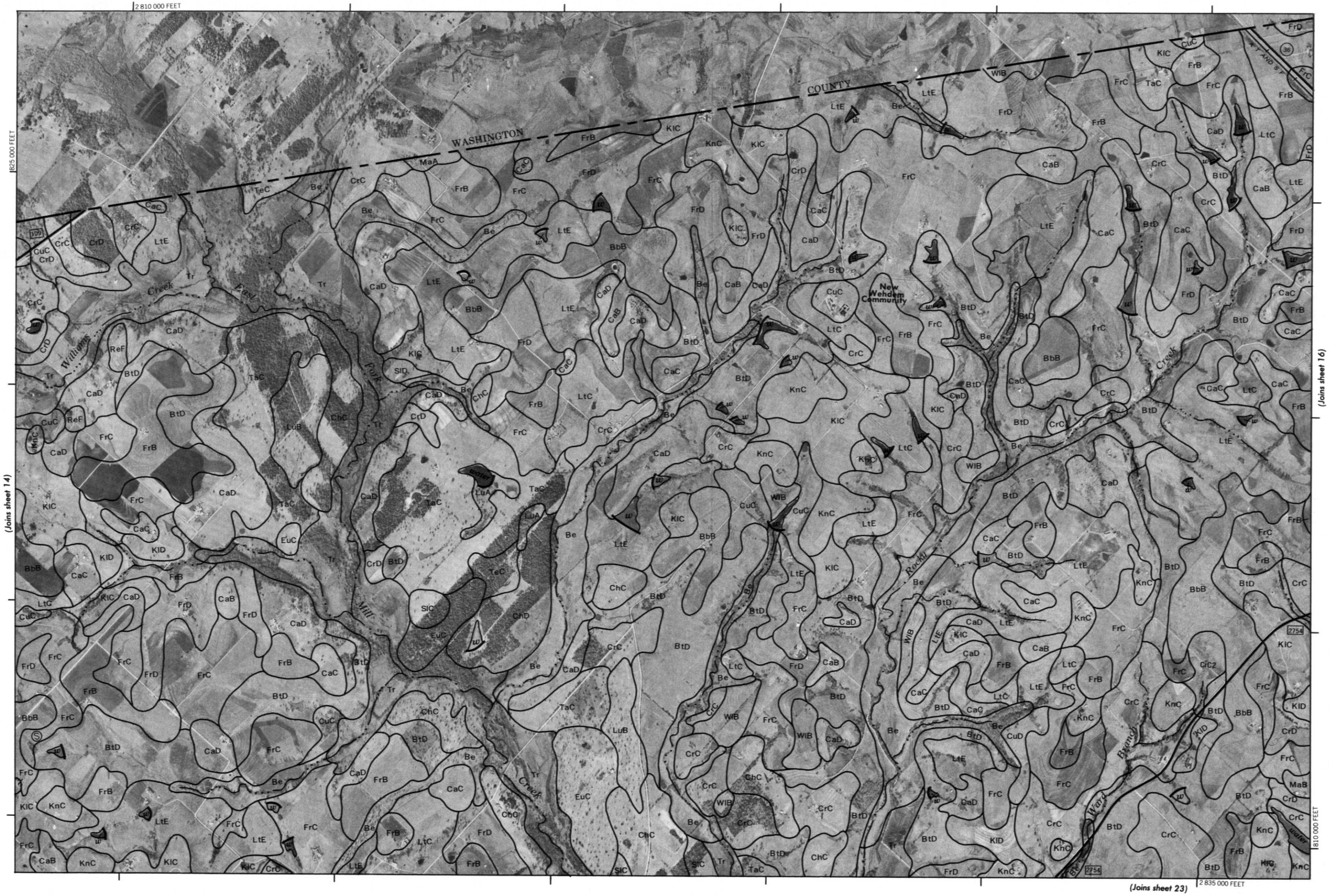
10000 Feet

5000

4000

Scale 1:24 000


14
N
2 Miles
10000 Feet
5000
1
0
0
1000
2000
3000
4000
5000
Scale 1:24 000
(Joins sheet 13)
(Joins sheet 15)
(Joins sheet 22)
2 805 000 FEET
825 000 FEET
810 000 FEET
2 780 000 FEET
WASHINGTON
COUNTY
Williams
Creek
Spring
Branch
Branch
Dogwood
Branch
Sandy
Creek
Lime
water
2502
109


2 810 000 FEET
2 825 000 FEET
WASHINGTON COUNTY
New Wehdem Community
Williams Creek
Mill Creek
Rocky Branch
Ward Branch
(Joins sheet 14)
(Joins sheet 16)
(Joins sheet 23)
2 835 000 FEET
2 810 000 FEET
15
N
2 Miles
10000 Feet
Scale 1:24000


16
N
(Joins inset, sheet 13)
(Joins sheet 15)
(Joins sheet 17)
(Joins sheet 24)
2 865 000 FEET
825 000 FEET
810 000 FEET
2 840 000 FEET
Scale 1:24000
2 Miles
10 000 Feet
5000
1000
2000
3000
4000
WASHINGTON COUNTY
Caney Creek
Buffalo Creek
Campbell Branch
Kenney
water
ATCHISON
TOPEKA
SANTA FE


2 870 000 FEET
825 000 FEET
WASHINGTON
COUNTY
Caney
Creek
water
Buckhorn
Tays
Creek
(Joins sheet 16)
(Joins sheet 18)
(Joins sheet 25)
2 895 000 FEET
815 000 FEET

17
N
2 Miles
10000 Feet
5000
1
Scale 1:24000
0
1000
2000
3000
4000
5000

18

N

Scale 1:24000

2 Miles — 10000 Feet

1 — 5000

0 — 0

¼ — 1000

½ — 2000

¾ — 3000

1 — 4000

¾ — 5000

(Joins sheet 9)

(Joins sheet 17)

(Joins sheet 19)

(Joins sheet 26)

2 925 000 FEET

830 000 FEET

815 000 FEET

2 900 000 FEET

WASHINGTON COUNTY

BRAZOS RIVER

WALLER COUNTY

AUSTIN COUNTY

Perry Creek

Lake Laurelville

Carey Creek

HEMPSTEAD (county seat)

1887

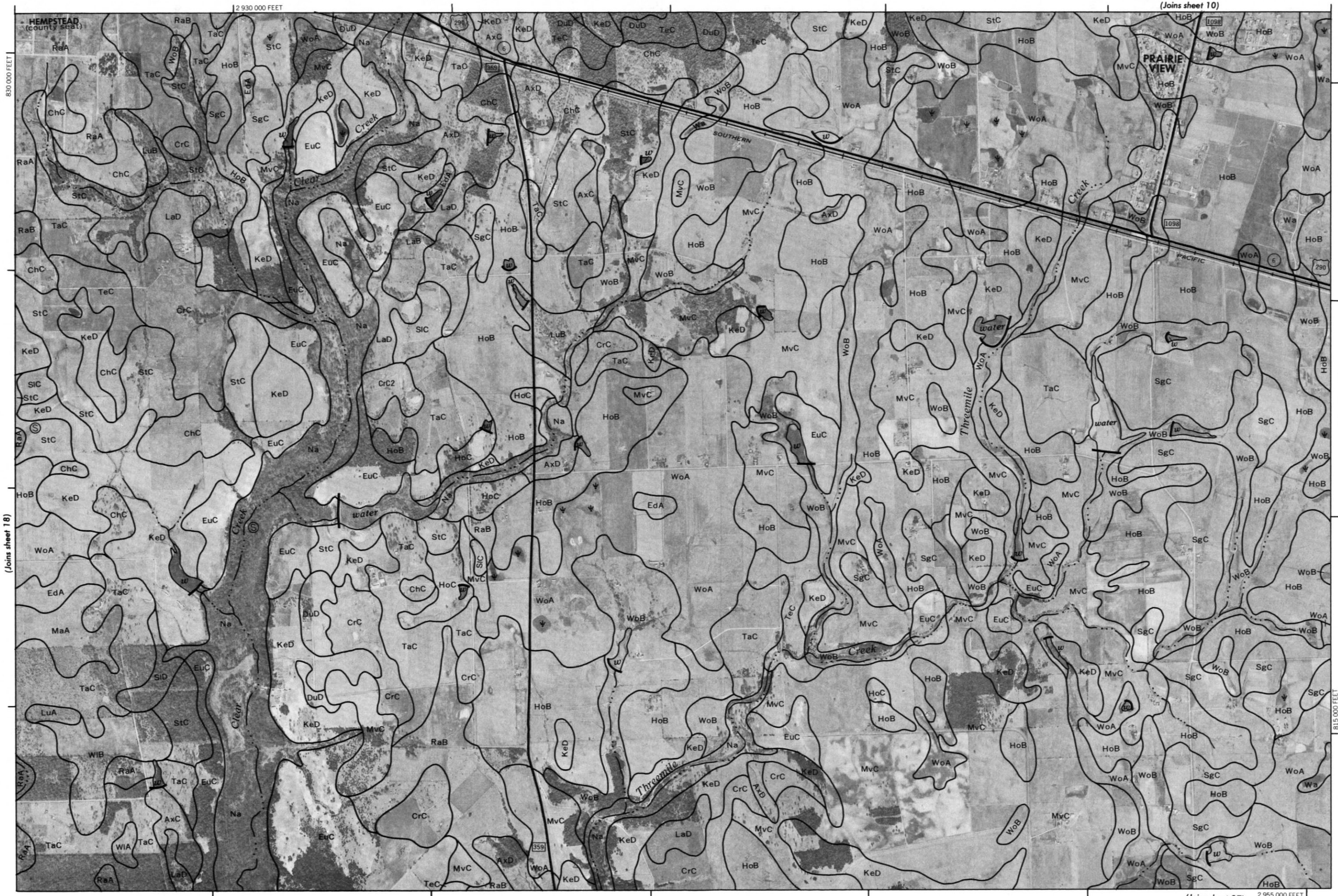
159

3346

1456

150

AUSTIN AND WALLER COUNTIES, TEXAS — SHEET NUMBER 19



AUSTIN AND WALLER COUNTIES, TEXAS — SHEET NUMBER 20

20

N

2 Miles

10000 Feet

Scale 1:24000

1 5000 0 1 000 2 000 3 000 4 000 5000

(Joins sheet 11)

(Joins sheet 19)

(Joins sheet 28)

2 980 000 FEET

2 960 000 FEET

830 000 FEET

815 000 FEET

SOUTHERN PACIFIC

HARRIS COUNTY

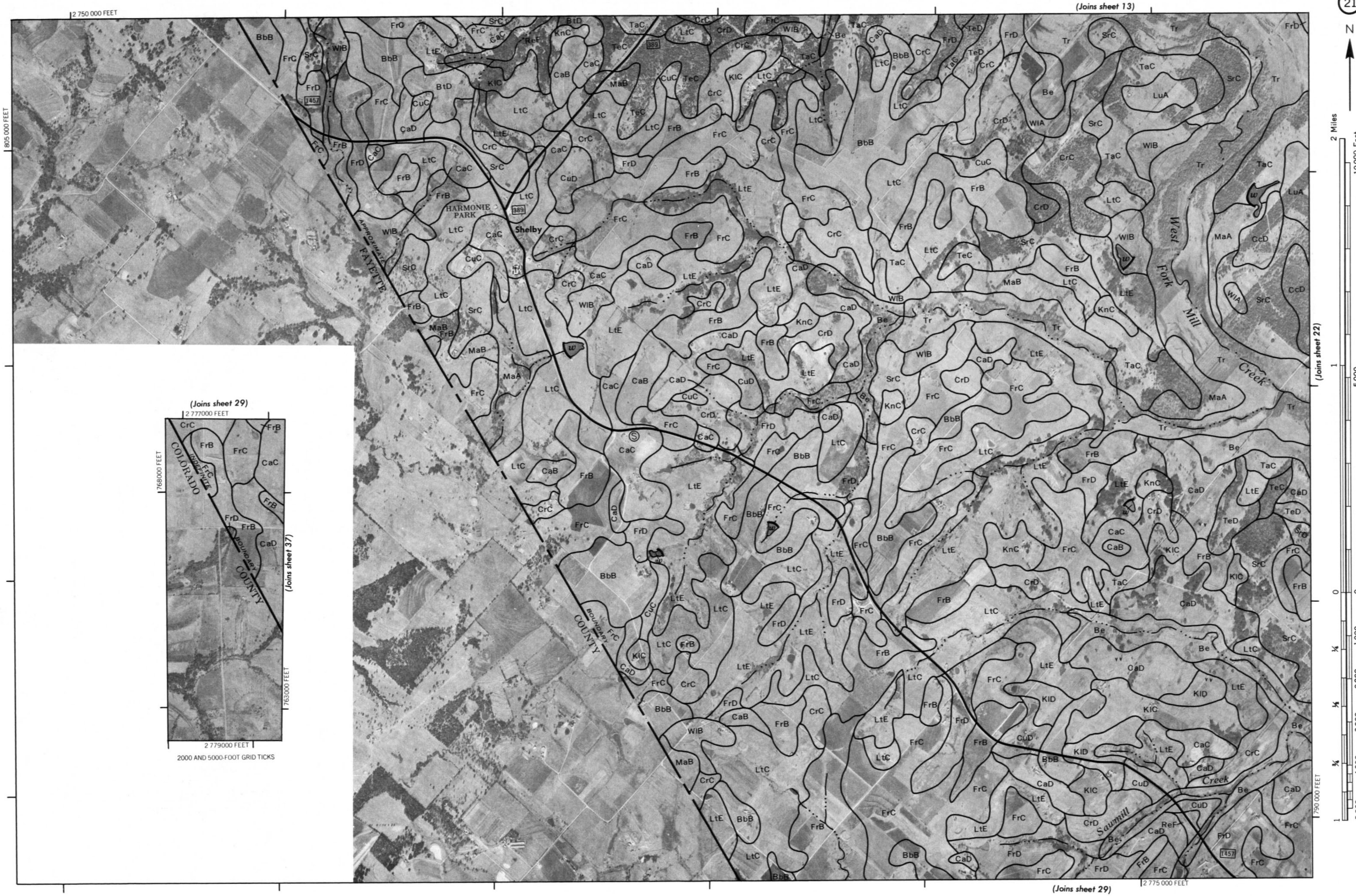
WALLER

Mound Creek

Mound Creek

water

Wa WoA HoB HpC WoB MdA MvC KeD SgC KaA HoC Na ArA


21
(Joins sheet 13)
2 750 000 FEET
805 000 FEET
HARMONIE PARK
Shelby
APPROXIMATE
FAYETTE
COUNTY
BOUNDARY
West Fork Mill Creek
Sawmill Creek
(Joins sheet 22)
(Joins sheet 29)
2 775 000 FEET
790 000 FEET
(Joins sheet 29)
2 777000 FEET
768000 FEET
COLORADO
INDEFINITE
BOUNDARY
COUNTY
(Joins sheet 37)
763000 FEET
2 779000 FEET
2000 AND 5000-FOOT GRID TICKS
N
Scale 1:24000
2 Miles
10 000 Feet


N
(Joins sheet 14)
(Joins sheet 21)
(Joins sheet 23)
(Joins sheet 30)
2 805 000 FEET
805 000 FEET
790 000 FEET
2 780 000 FEET
Scale 1:24 000
2 Miles
10 000 Feet
Welcome
Bleiblerville
West Mill Creek
Dogwood Fork
Sawmill Creek
West Fork Mill Creek
Pecan Branch
Rocky Branch
Mill Branch
109
2502

(23)

N

2 810 000 FEET

805 000 FEET

(Joins sheet 15)

(Joins sheet 22)

(Joins sheet 31)

2 835 000 FEET

790 000 FEET

Bleiblerville

Millseat Branch

East Fork Rocky Creek

Mill Creek

Ward Branch

Beaty Branch

Long Branch

East Fork Mill Creek

Campbell Branch

(Joins sheet 24)

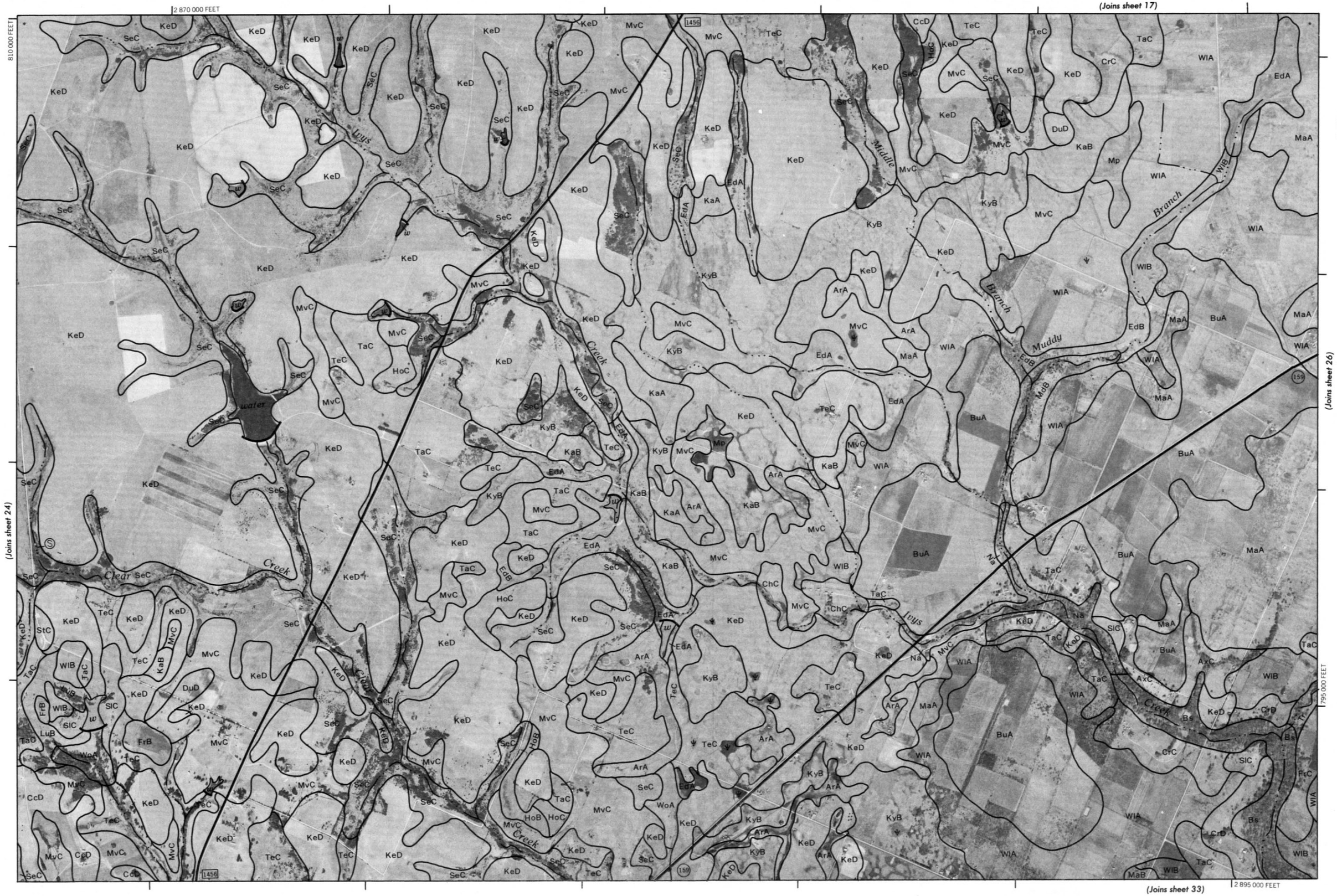
2 Miles

10000 Feet

5000

Scale 1:24000


24
N
(Joins sheet 16)
(Joins sheet 23)
(Joins sheet 25)
(Joins sheet 32)
2 865 000 FEET
810 000 FEET
790 000 FEET
2 840 000 FEET
Scale 1:24 000
2 Miles
10 000 Feet
5000
Buffalo Creek
Branch
Campbell
Long Branch
Piney Creek
Clear Creek
East Fork Mill Creek
ATCHISON TOPEKA AND SANTA FE
water


2 870 000 FEET
810 000 FEET
(Joins sheet 17)
(Joins sheet 24)
(Joins sheet 26)
(Joins sheet 33)
2 895 000 FEET
795 000 FEET
25
N
2 Miles
10000 Feet
Scale 1:24000
1456
159
Clear Creek
Ivys
Middle Branch
Branch
Muddy
Creek
water


26
N
(Joins sheet 18)
(Joins sheet 25)
(Joins sheet 27)
(Joins sheet 34)
2 925 000 FEET
2 900 000 FEET
810 000 FEET
795 000 FEET
Scale 1:24000
2 Miles
10000 Feet
Cochran
Raccoon Bend
WALLER
AUSTIN
COUNTY
BRAZOS
RIVER
Clear
Creek
1456
159
331
1887

(Joins sheet 19)

2 930 000 FEET

810 000 FEET

(Joins sheet 26)

(Joins sheet 35)

2 955 000 FEET

795 000 FEET

(Joins sheet 28)

27

N

2 Miles

10000 Feet

1

Scale 1:24000

5000

0

1000

2000

3000

4000

5000

Threemile Creek

Clear Creek

Bayou

Beef Creek

Harris Creek

Harris Creek

Creek

water

359

TaC RaA LuA LaD AxC Na EuC TeC CrC MvC RaB AxD WoA KeD LaB TeD StC ChD SlD WlB BrA Cm BrB Bs EdA EdB KaA MdA HoB HbB WoB SgC Wa w

AUSTIN AND WALLER COUNTIES, TEXAS — SHEET NUMBER 28

28

N

(Joins sheet 20)

2 985 000 FEET

810 000 FEET

(Joins sheet 27)

795 000 FEET

2 960 000 FEET

(Joins sheet 36)

2 Miles

10000 Feet

Scale 1:24000

5000 4000 3000 2000 1000 0 0

1 5000

Mound Creek

HARRIS COUNTY

Snake Creek

Cypress Creek

SKY LAKES AIRFIELD

362

29

N

2 750 000 FEET

785 000 FEET

(Joins sheet 21)

(Joins sheet 37)

2 795 000 FEET

750 000 FEET

(Joins sheet 45)

745 000 FEET

2 805 000 FEET

2 775 000 FEET

770 000 FEET

(Joins inset, sheet 21)

(Joins sheet 30)

FAYETTE COUNTY BOUNDARY (APPROXIMATE)

COLORADO COUNTY BOUNDARY (INDEFINITE)

San Bernard River

Pastoria Creek

2 Miles

10000 Feet

1

5000

Scale 1:24000

0 1000 2000 3000 4000 5000

AUSTIN AND WALLER COUNTIES, TEXAS — SHEET NUMBER 30

30

N

(Joins sheet 22)

2 805 000 FEET

785 000 FEET

(Joins sheet 29)

(Joins sheet 31)

2 780 000 FEET

770 000 FEET

(Joins sheet 37)

2 Miles 10000 Feet

Scale 1:24000

West Fork Mill Creek

Industry

Oak Point Creek

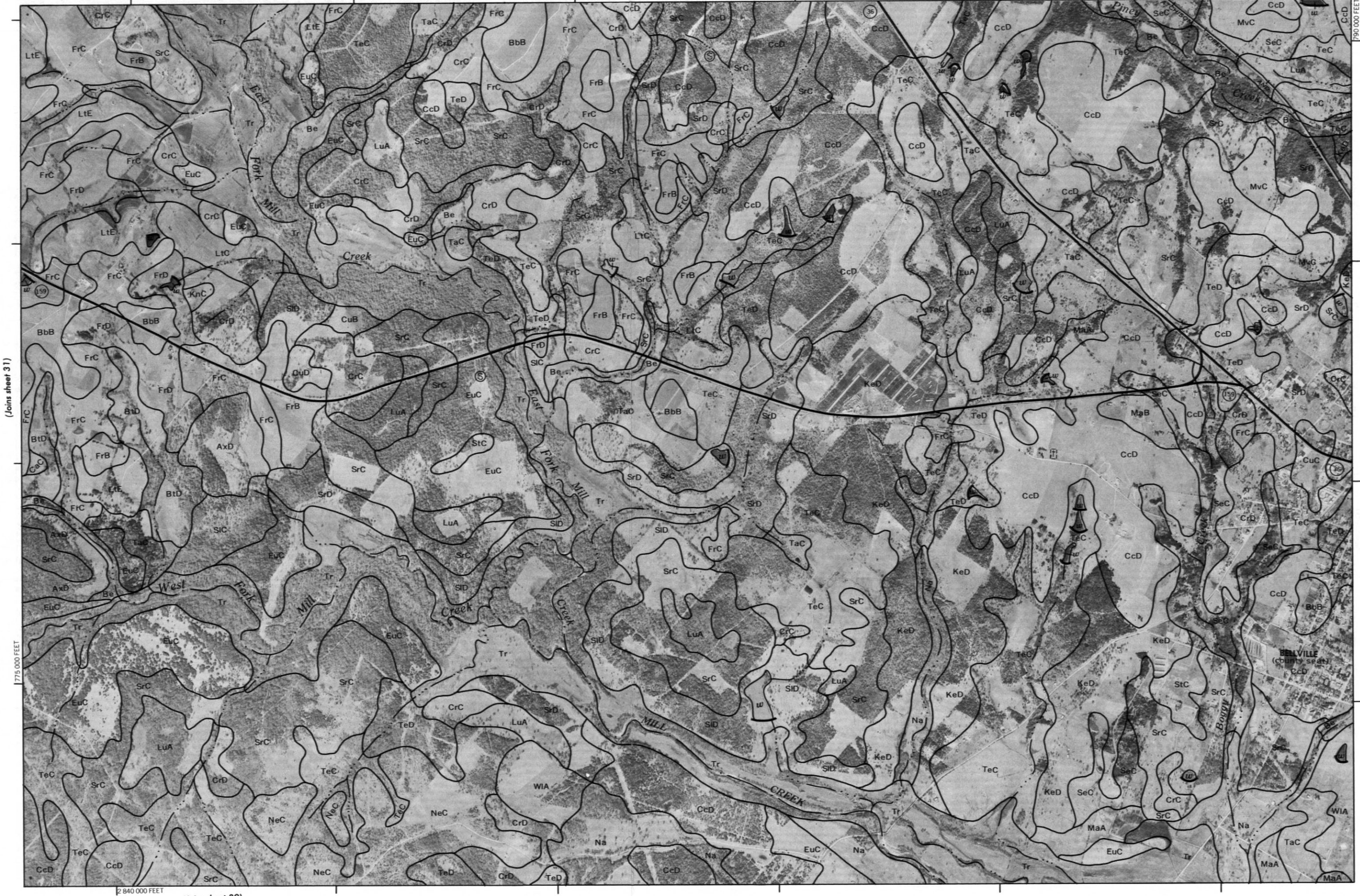
Pastoren Creek

Post Oak Point Creek

Amelia Creek

SANDY CREEK


2 810 000 FEET
(Joins sheet 23)
785 000 FEET
(Joins sheet 30)
Nelsonville
Long Branch
West Fork Mill Creek
SANDY CREEK
Meckelroy Branch
Walnut Creek
Black Dry Be Branch
West Fork Mill Creek
Black Branch
water
2754
2502
159
(Joins sheet 32)
775 000 FEET
2 835 000 FEET
(Joins sheet 38)
31
N
2 Miles
10000 Feet
Scale 1:24000
1 0 1 2 3 4 5 5000 0 1000 2000 3000 4000 5000


32
N
(Joins sheet 24)
2 865 000 FEET
790 000 FEET
2 Miles
10000 Feet
5000
Scale 1:24000
0
1000
2000
3000
4000
5000
(Joins sheet 31)
775 000 FEET
2 840 000 FEET
(Joins sheet 39)
(Joins sheet 33)
East Fork Mill Creek
West Fork Mill Creek
MILL CREEK
Piney
Creek
Bonny
BELLVILLE
(county seat)
159
36

AUSTIN AND WALLER COUNTIES, TEXAS — SHEET NUMBER 33

(Joins sheet 25)

2 870 000 FEET

790 000 FEET

(Joins sheet 32)

(Joins sheet 34)

(Joins sheet 40)

2 895 000 FEET

775 000 FEET

33

N

2 Miles

10000 Feet

Scale 1:24000

BELLVILLE (county seat)

GRAWUNDER AIRFIELD

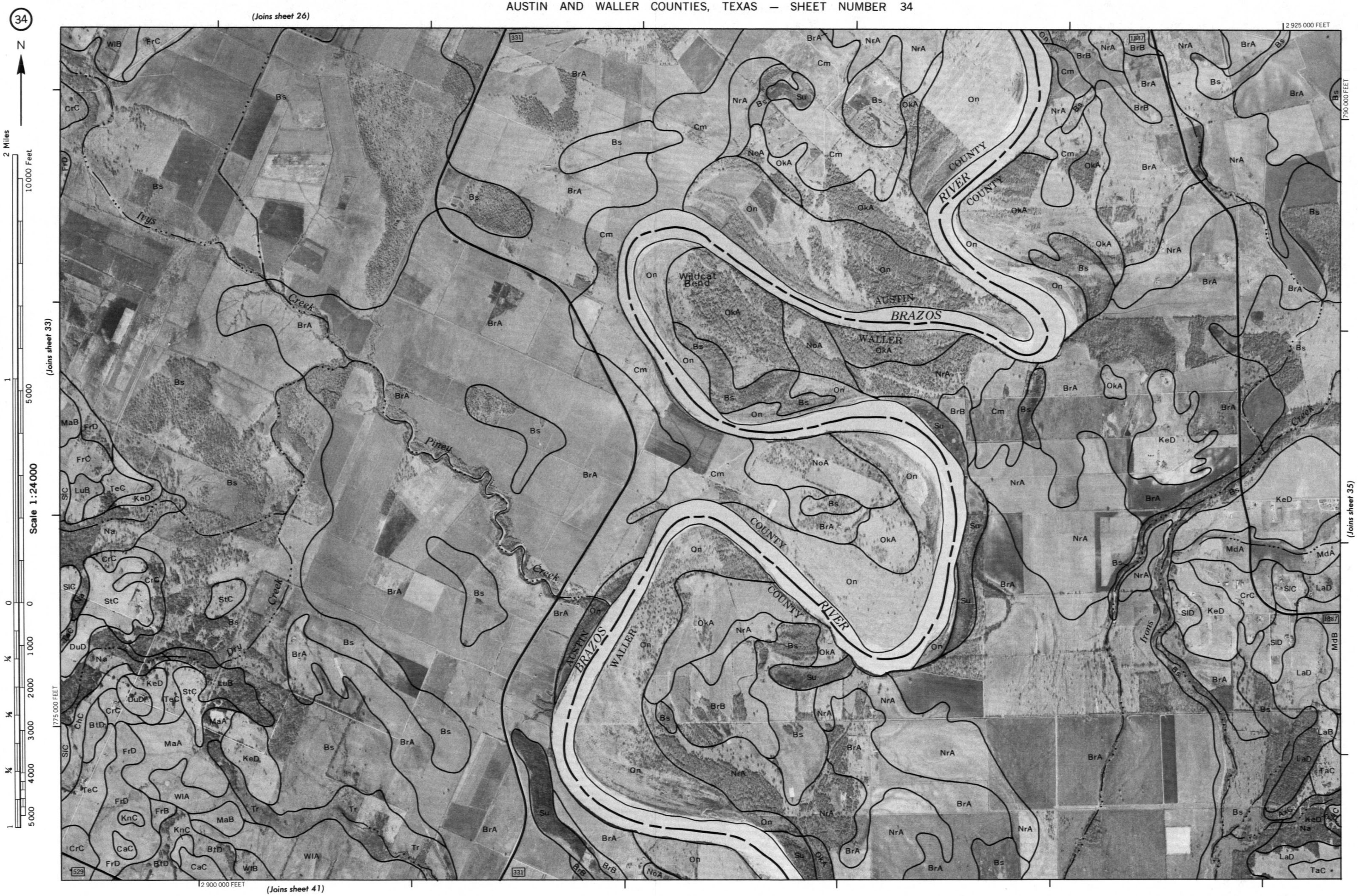
Piney Creek

Dry Creek

Creek

water

SANTA MAB


34
N
(Joins sheet 26)
(Joins sheet 33)
(Joins sheet 35)
(Joins sheet 41)
2 925 000 FEET
790 000 FEET
275 000 FEET
2 900 000 FEET
Scale 1:24000
2 Miles
10000 Feet
1
5000
0
1000
2000
3000
4000
5000
¼
½
¾
1
BRAZOS RIVER
AUSTIN COUNTY
WALLER COUNTY
Wildcat Bend
Ivys Creek
Piney Creek
Dry Creek
Irons Creek
331
1887
529
BrA
NrA
Bs
Cm
On
OkA
NoA
Su
BrB
KeD
MdA
SlC
SlD
LaD
LaB
TaC
CrC
FrD
FrC
MaB
MaA
LuB
TeC
StC
DuD
Na
ChC
BtD
WlA
WlB
KnC
CaC
Tr
MdB
AxG

(Joins sheet 27)

2 930 000 FEET

790 000 FEET

(Joins sheet 34)

(Joins sheet 36)

(Joins sheet 42)

2 955 000 FEET

775 000 FEET

35

N

2 Miles

10000 Feet

1

5000

Scale 1:24000

0

1000

2000

3000

4000

5000

Beef Bayou

Harris Creek

Iron Creek

Harris Creek

Creek

water

Menaville

BESSIES CREEK

359

1887

36

N

Scale 1:24000

2 Miles 10000 Feet 1 5000

(Joins sheet 28)

(Joins sheet 35)

(Joins sheet 43)

(Joins inset, sheet 51)

2 985 000 FEET

790 000 FEET

775 000 FEET

2 960 000 FEET

362

HoB WoA Wa MvC SgC KaA ArA EdA KaB Na KeD WoB

water

Live Oak Creek

Mound Creek

Cypress Creek

HARRIS COUNTY

(Joins sheet 30)

(Joins inset, sheet 21)

2 780 000 FEET

765 000 FEET

37

N

2 Miles

10000 Feet

5000

Scale 1:24000

0

1000

2000

3000

4000

5000

(Joins sheet 38)

1

¼

½

¾

1

750 000 FEET

2 805 000 FEET

(Joins inset, sheet 29)

COLORADO

INDEFINITE

COUNTY

BOUNDARY

MISSOURI

KANSAS

TEXAS

SANDY

CREEK

Oak Point Creek

Post

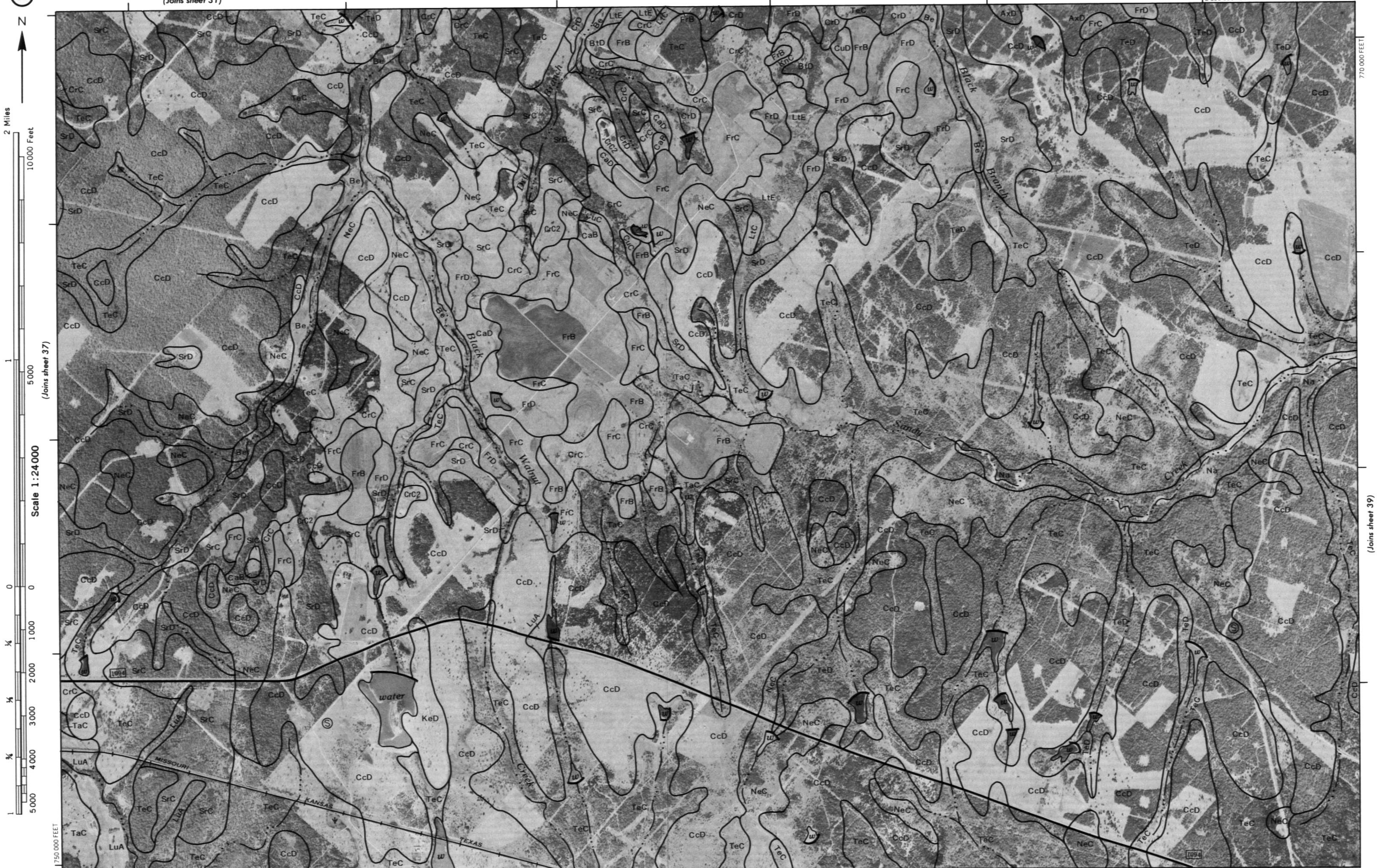
Redgate Creek

New Ulm

water

109

1094


(Joins sheet 31)
N
2 835 000 FEET
770 000 FEET
(Joins sheet 37)
(Joins sheet 39)
(Joins sheet 45)
2 810 000 FEET
750 000 FEET
Scale 1:24 000
2 Miles
10 000 Feet
1
5000
0
1000
2000
3000
4000
5000
Black Branch
Walnut Creek
Sandy Creek
water
MISSOURI
KANSAS
TEXAS
1094

(Joins sheet 32)

2 840 000 FEET

770 000 FEET

(Joins sheet 38)

(Joins sheet 40)

(Joins sheet 46)

2 865 000 FEET

775 000 FEET

39

N

2 Miles

10000 Feet

Scale 1:24000

5000 0 5000

1 0 1

¼ 0 ¼

½ 1000 2000

¾ 2000 3000

¼ 3000 4000

½ 4000 5000

¾ 5000

1

40

N

(Joins sheet 33)

2 895 000 FEET

770 000 FEET

2 Miles

10000 Feet

1

5000

(Joins sheet 39)

Scale 1:24000

0 0 1000 2000 3000 4000 5000

1

755 000 FEET

2 870 000 FEET

(Joins sheet 47)

(Joins sheet 41)

MILL CREEK

Cat Spring Creek

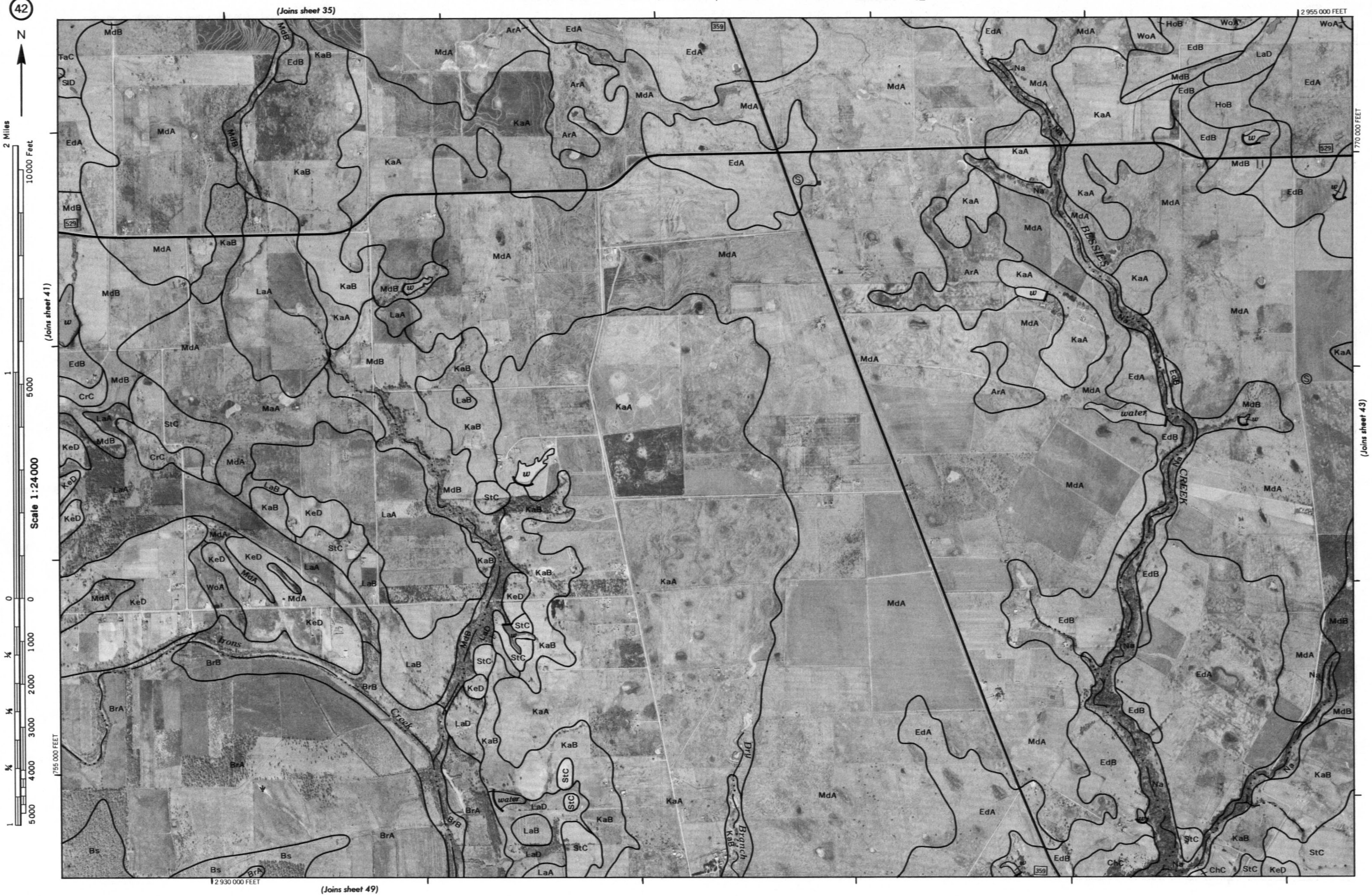
Clear Creek

Dwearingen

ATCHISON TOPEKA AND SANTA FE

SANTA FE


41
N
(Joins sheet 34)
(Joins sheet 42)
(Joins sheet 48)
(Joins sheet 40)
2 900 000 FEET
770 000 FEET
755 000 FEET
2 925 000 FEET
Burleigh
Sunny Side
BRAZOS RIVER
BRAZOS RIVER
WALLER COUNTY
AUSTIN COUNTY
Williams Creek
Irons Creek
MILL CREEK
Cuny Lake
Hannay Lake
Palmer Lake
water
529
331
Scale 1:24000
2 Miles
1
0
10000 Feet
5000
0
1000
2000
3000
4000
5000
¼
½
¾


42
N
(Joins sheet 35)
(Joins sheet 41)
(Joins sheet 43)
(Joins sheet 49)
2 955 000 FEET
770 000 FEET
755 000 FEET
2 930 000 FEET
Scale 1:24000
2 Miles
10000 Feet
5000
Irons
Creek
Dry
Branch
BESSIES
CREEK
water
359
529

2 960 000 FEET

1 770 000 FEET

(Joins sheet 36)

(Joins sheet 42)

(Joins sheet 44)

(Joins sheet 50)

2 985 000 FEET

755 000 FEET

43

N

Scale 1:24000

2 Miles 1

10000 Feet 5000 0 1000 2000 3000 4000 5000

water

w

362

529

2855

44

N

Scale 1:24000

2 Miles 10000 Feet

1 5000

0 0

¼ 1000

½ 2000

¾ 3000

1 4000

5000

(Joins inset, sheet 51)

3 015 000 FEET

770 000 FEET

(Joins sheet 43)

(Joins inset, sheet 1)

2 895 000 FEET

850 000 FEET

(Joins sheet 9)

Cypress Creek

HARRIS COUNTY

WASHINGTON COUNTY

Mexican Bend

BRAZOS RIVER

WASHINGTON

water

Na MvC KaA ArA EdA KaB On OkA Bs BrA Su Cm

290 529

755 000 FEET

2 990 000 FEET

835 000 FEET

2 890 000 FEET

(Joins sheet 51)

AUSTIN AND WALLER COUNTIES, TEXAS — SHEET NUMBER 45

45

N

2 810 000 FEET

750 000 FEET

(Joins sheet 38)

(Joins inset, sheet 29)

(Joins sheet 46)

2 835 000 FEET

735 000 FEET

2 Miles

10000 Feet

5000

Scale 1:24000

1 0 1 2 3 4 5000

1 0 1000 2000 3000 4000 5000

MISSOURI

KANSAS

TEXAS

COLORADO

Panther Creek

Yellow Creek

Schwaner Creek

San Bernard River

San Bernard River

WoA

1094

(Joins sheet 39)

2 865 000 FEET

2 750 000 FEET

(Joins sheet 45)

(Joins sheet 47)

2 840 000 FEET

(Joins sheet 52)

46

N

2 Miles

10000 Feet

Scale 1:24000

1 0 1 0

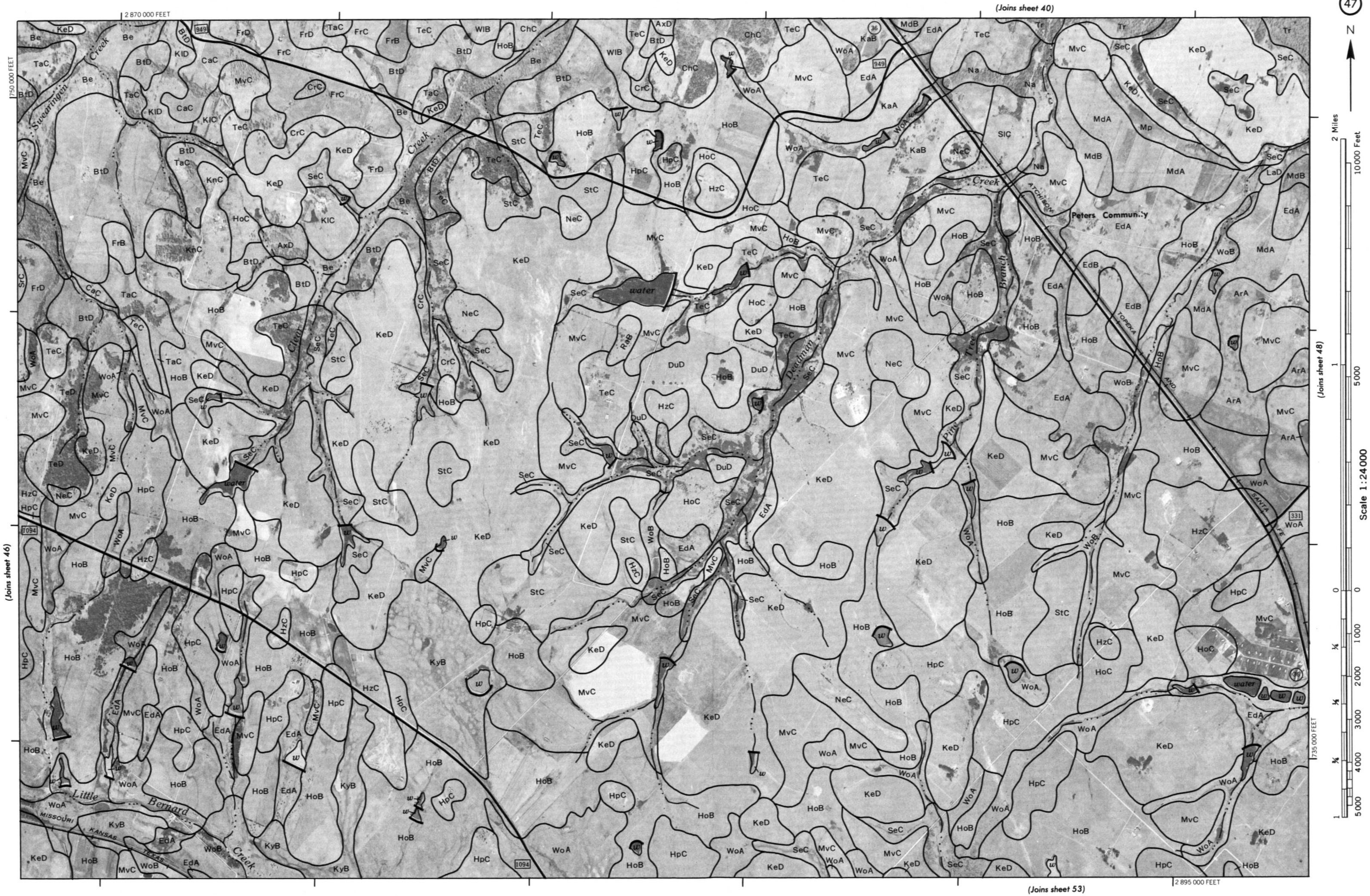
5000 1000 5000

¼ ¼ ¼ ¼

4000 2000 3000

735 000 FEET

Creek
Spring
Cat
Schuelter
Creek
Plum
Creek
Schweiner
Creek
Yellow
Creek
Constance
Creek
Siegerlingen
Creek
Little
Bernard
Creek
Bernard
Creek
Red Hill
Cat Spring
MISSOURI
KANSAS
TEXAS
COLORADO
San
BERNARD COUNTY
River
water
1094
2187
349
948


(Joins sheet 40)
(Joins sheet 46)
(Joins sheet 48)
(Joins sheet 53)
2 870 000 FEET
2 895 000 FEET
750 000 FEET
735 000 FEET
N
Scale 1:24000
2 Miles
10 000 Feet
Peters Community
Swearingen Creek
Clear Creek
Deadman Creek
Pine Creek
Little Bernard Creek
Tree Branch
ATCHISON TOPEKA AND SANTA FE
MISSOURI KANSAS TEXAS
water
949
36
1094
331


48
N
(Joins sheet 41)
(Joins sheet 47)
(Joins sheet 49)
(Joins sheet 54)
2 925 000 FEET
750 000 FEET
735 000 FEET
2 900 000 FEET
Scale 1:24000
2 Miles
10 000 Feet
BRAZOS
RIVER
AUSTIN COUNTY
WALLER COUNTY
MILL CREEK
Williams Creek
Garret Lake
STEPHEN F. AUSTIN STATE PARK
ATCHISON TOPEKA AND SANTA FE
water
331
36
3318

AUSTIN AND WALLER COUNTIES, TEXAS — SHEET NUMBER 49

2 930 000 FEET

750 000 FEET

(Joins sheet 42)

(Joins sheet 48)

(Joins sheet 55)

2 955 000 FEET

735 000 FEET

Clemons Community

Pattison

Creek

Branch

Dry

Irons

CREEK

BESSIES

Bessies Bayou

water

49

N

2 Miles

10000 Feet

(Joins sheet 50)

Scale 1:24000

50

N

Scale 1:24000

2 Miles 0 1 10000 Feet

1 0 ¼ 1000 ½ 2000 ¾ 3000 1 4000 5000

(Joins sheet 43)

(Joins sheet 49)

(Joins sheet 51)

(Joins sheet 56)

2 985 000 FEET

2 960 000 FEET

735 000 FEET

750 000 FEET

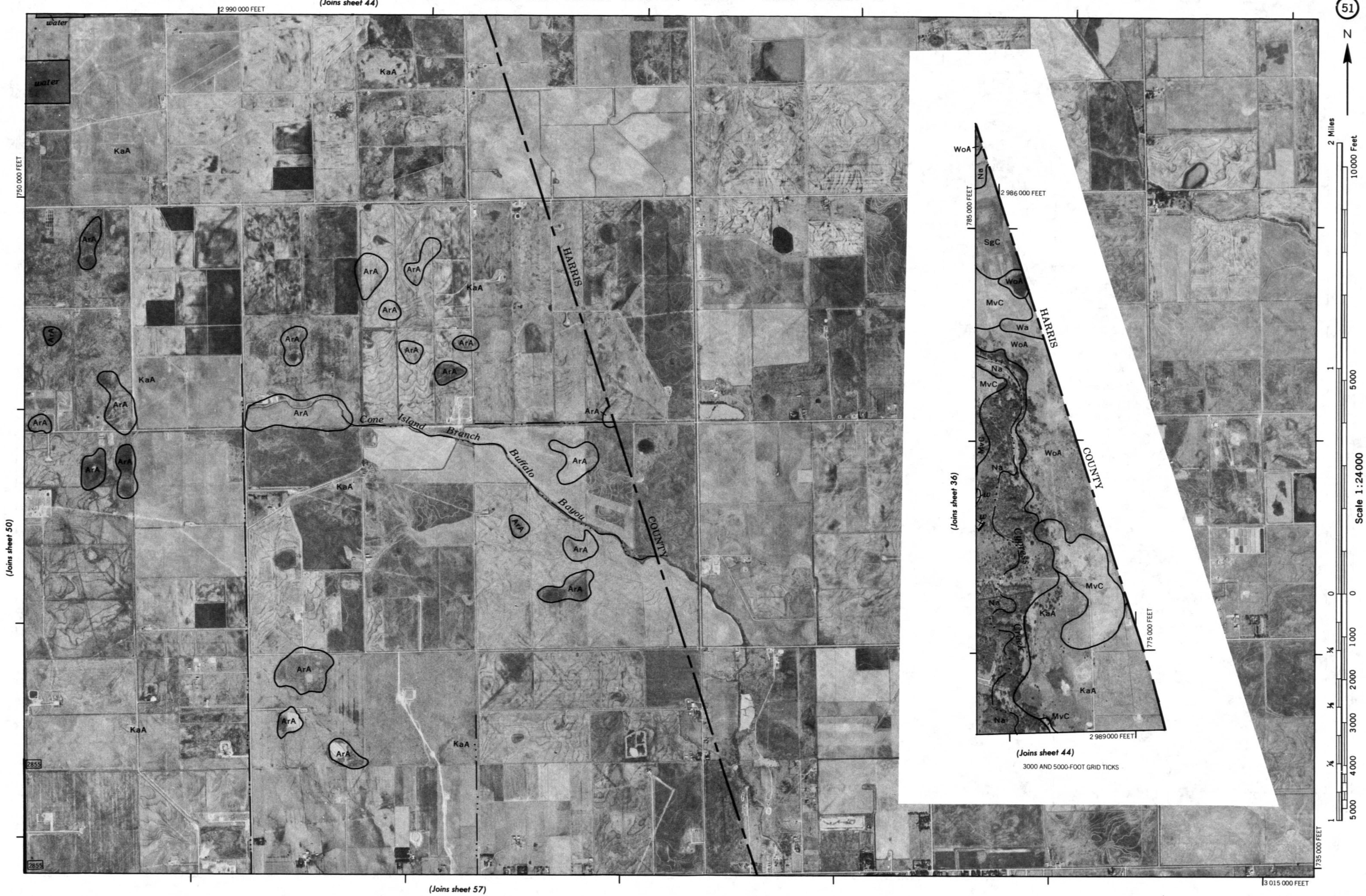
362

2855

Bull Bolton Creek

water

ArA KaA KaB StC w


(Joins sheet 44)
2 990 000 FEET
51
N
water
water
KaA
750 000 FEET
ArA
HARRIS
COUNTY
Cone Island Branch
Buffalo Bayou
(Joins sheet 50)
2855
(Joins sheet 57)
WoA
Na
785 000 FEET
2 986 000 FEET
SgC
MvC
Wa
(Joins sheet 36)
775 000 FEET
2 989 000 FEET
(Joins sheet 44)
3000 AND 5000-FOOT GRID TICKS
Cypress Creek
735 000 FEET
3 015 000 FEET
2 Miles
10 000 Feet
Scale 1:24 000

52

N

2 Miles

10000 Feet

Scale 1:24000

5000

0

1000

2000

3000

4000

5000

(Joins sheet 58)

2 869000 FEET

690 000 FEET

(Joins sheet 63)

2 865 000 FEET

4000 AND 5000-FOOT GRID TICKS

(Joins sheet 46)

2 865 000 FEET

730 000 FEET

(Joins sheet 53)

2 845 000 FEET

(Joins sheet 58)

water

COLORADO RIVER

BERNARD RIVER

COUNTY

Crooked Branch

2187

HoB KuC KaA MvC ArA KaB SeC WoA HpC HoC CrC EdA SrC FrB KeD WoB HzC Wa Ws Mp

(Joins sheet 47)

(Joins sheet 52)

(Joins sheet 54)

(Joins sheet 59)

2 870 000 FEET

730 000 FEET

715 000 FEET

2 895 000 FEET

53

N

Scale 1:24000

2 Miles

10000 Feet

5000

1

0

1000

2000

3000

4000

5000

Little Bernard Creek

MISSOURI KANSAS TEXAS

Bollinger Creek

Crooked Branch

SANTA FE AND TOPEKA ATCHISON

1094

2187

90

(Joins sheet 48)

N

2 925 000 FEET

(Joins sheet 53)

(Joins sheet 55)

730 000 FEET

715 000 FEET

2 900 000 FEET

(Joins sheet 60)

Scale 1:24 000

2 Miles

10 000 Feet

1

5000

0 0

¼ 1000

2000

½ 3000

¾ 4000

1 5000

AUSTIN AND WALLER COUNTIES, TEXAS — SHEET NUMBER 55

55

N

2 930 000 FEET

1 730 000 FEET

(Joins sheet 49)

(Joins sheet 54)

(Joins sheet 56)

(Joins sheet 61)

2 955 000 FEET

1 715 000 FEET

2 Miles

10 000 Feet

Scale 1:24 000

WALLER

AUSTIN

BRAZOS

COUNTY

Irons

Creek

Bayou

Bessies

Bell

Bottom

CREEK

RIVER

TEXAS

KANSAS

MISSOURI

water

AUSTIN AND WALLER COUNTIES, TEXAS — SHEET NUMBER 56

56

N

Scale 1:24000

2 Miles 10000 Feet

1 5000

0 0

1/4 1/4 1000 2000

1/4 1/4 3000 4000

1/4 1/4 5000

(Joins sheet 50)

(Joins sheet 55)

(Joins sheet 57)

(Joins sheet 62)

2 985 000 FEET

730 000 FEET

715 000 FEET

2 960 000 FEET

KaA KaB StC TaC ArA AxD BrA Bs BrB KeD LaD NrA Na ChC

Bottom Creek Bell Creek BESSIES CREEK Willow Fork Buffalo Bayou Brookshire Cardiff

AIR RICE AIRFIELD

MISSOURI KANSAS TEXAS

FORT BEND COUNTY

(Joins sheet 51)

2 990 000 FEET

(Joins sheet 56)

730 000 FEET

GAS PLANT

KaA

ArA

water

Snake Creek

HARRIS COUNTY

KATY

Na

Johnsue

MISSOURI KANSAS TEXAS

FORT BEND COUNTY BOUNDARY

Willow Fork Buffalo Bayou

INDEFINITE

2855

90

10

715 000 FEET

3 015 000 FEET

57

N

2 Miles

10000 Feet

Scale 1:24000

1 5000 0 0 1 1000 2000 3000 4000 5000

AUSTIN AND WALLER COUNTIES, TEXAS — SHEET NUMBER 58

58

N

2 Miles 10000 Feet

1 5000

Scale 1:24000

0 0 1000 2000 3000 4000 5000

(Joins sheet 52)

2 865 000 FEET

710 000 FEET

(Joins sheet 63)

2 895 000 FEET

2 885 000 FEET

674 000 FEET

695 000 FEET

5000 AND 9000-FOOT GRID TICKS

665 000 FEET

2 840 000 FEET

(Joins sheet 66)

(Joins sheet 59)

(Joins inset, sheet 52)

San Bernard COLORADO River

COLORADO San Bernard COUNTY River

WHARTON COUNTY

KuC KaB KaA ArA HoB WoA MvC SeC KyB MdA Wa Mp w

(Joins sheet 53)

2 870 000 FEET

210 000 FEET

(Joins sheet 58)

(Joins sheet 63)

2 895 000 FEET

695 000 FEET

(Joins sheet 60)

59

N

2 Miles

10000 Feet

5000

Scale 1:24000

Crooked Branch

East Bernard Creek

Little Bernard Creek

Bernard Creek

SANTA FE

AND

TOPEKA

ATCHISON

Lake Virnau

Rexville

water

water

3013

3013

60

N

(Joins sheet 54)

2 925 000 FEET

710 000 FEET

(Joins sheet 59)

(Joins sheet 61)

695 000 FEET

2 900 000 FEET

(Joins sheet 64)

2 Miles 10000 Feet 5000

Scale 1:24000

1 0 1 0 ¼ 1000 ½ 2000 ¾ 3000 1 4000 5000

Allens Creek

Frydek

Archison, Topeka and Santa Fe

KaA KaB HoB WoB WoA MvC EdA EdB Mp MdA LaA LaD KuC StC ArA BrA MdB

(Joins sheet 55)

2 930 000 FEET

710 000 FEET

(Joins sheet 60)

(Joins sheet 65)

2 955 000 FEET

695 000 FEET

61

N

2 Miles

10000 Feet

(Joins sheet 62)

Scale 1:24000

BRAZOS RIVER

AUSTIN COUNTY

WALLER COUNTY

FORT BEND COUNTY

BESSIES CREEK

Ward's Lake

1458

1489

62

N

Scale 1:24000

2 Miles 10000 Feet 1 5000 (Joins sheet 61)

(Joins sheet 56)

2 985 000 FEET

710 000 FEET

695 000 FEET

2 960 000 FEET

BESSIES CREEK

FORT BEND COUNTY

Brookshire

Elm Slough

water

BrA NrA LaD KaB KaA Na StC KeD NoA Bs Cm OkA EdB EdA MvC ArA LaA LaB

1489 359 1952

(Joins sheet 67)

(Joins inset, sheet 66)

654 000 FEET

2 930 000 FEET

2 945 000 FEET

656 000 FEET

2000 AND 5000-FOOT GRID TICKS

2 870 000 FEET

690 000 FEET

(Joins sheet 59)

(Joins sheet 52)

(Joins inset, sheet 58)

2 895 000 FEET

675 000 FEET

63

N

2 Miles

10000 Feet

(Joins sheet 64)

Scale 1:24000

5000 0 0 1000 2000 3000 4000 5000

SANTA FE

TOPEKA AND

ATCHISON

Beard

San Bernard

COLORADO COUNTY

River

East Bernard Creek

Hog Branch

water

3013

KaA KaB KcB EdA KeD KuC KyB MvC ArA

64

N

2 Miles

10000 Feet

(Joins sheet 63)

1

5000

Scale 1:24000

0 1000 2000 3000 4000 5000

675 000 FEET

(Joins sheet 60)

2 925 000 FEET

690 000 FEET

(Joins sheet 65)

2 900 000 FEET

(Joins sheet 66)

KaA KaB EdA MdA LaA LaD LaB BrA Bs ArA KyB KuC MvC Mp EdB MdB CrC2 NrA KeD Be WoA Na

Allens Creek

ATCHISON TOPEKA AND SANTA FE

El Pleasant

Willow Creek

East Bernard Branch Creek

36

AUSTIN AND WALLER COUNTIES, TEXAS — SHEET NUMBER 65

(Joins sheet 61)

2 930 000 FEET

690 000 FEET

(Joins sheet 64)

(Joins sheet 67)

2 955 000 FEET

680 000 FEET

65

N

2 Miles

10000 Feet

Scale 1:24000

1 0 1 5000

¼ 0 ¼ 1000

½ 2000 ½ 3000

¾ 4000 ¾ 5000

LaB
LaD
BrA
Alligator Hole
Bs
Su
On
OkA
NrA
SlD
SlC
KaB
MdA
MdB
EdB
LaA
LaD
Cm
BrB
BRAZOS RIVER
BEND
FORT
COUNTY
Creek
Allens
SOUTHERN PACIFIC
1458
1093

66

N

Scale 1:24000

2 Miles 10000 Feet

1 5000 0 0 1000 2000 3000 4000 5000

(Joins sheet 64)

2 925 000 FEET

675 000 FEET

(Joins inset, sheet 58)

East Bernard Creek

Willow Branch

San Bernard River

Allens Creek

ATCHISON TOPEKA AND SANTA FE

SOUTHERN PACIFIC

WHARTON COUNTY

FORT BEND COUNTY

water

1093

(Joins sheet 67)

(Joins inset, sheet 66)

2 900 000 FEET

655 000 FEET

(Joins sheet 66)

2 929 000 FEET

653 000 FEET

(Joins inset, sheet 62)

2 922 000 FEET

2000 AND 7000-FOOT GRID TICKS

(Joins sheet 65)

2 930 000 FEET

675 000 FEET

67

N

2 Miles

10000 Feet

Scale 1:24000

BRAZOS RIVER

FORT BEND COUNTY

WALLIS

SOUTHERN PACIFIC

ATCHISON TOPEKA AND SANTA FE

Slough

Elm

water

1458

1093

1952

36

60

BrA LaA LaB LaD MdA MdB EdA EdB SlD Bs OkA NrA On

(Joins sheet 66)

(Joins inset, sheet 62)

2 955 000 FEET

660 000 FEET